

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

VOL. XXX.

June 23, 1934

No. 782

Notes and Comments

Overseas Trade Statistics

ELSEWHERE in this issue appears a summary of the Board of Trade returns for the month ended May 31, showing an all-round increase in the movement of chemical products compared with the corresponding month of 1933. The value of exports of chemicals, drugs, dyes and colours was up by 13.9 per cent., imports by 14.4 per cent. and re-exports by 18.9 per cent. To view the figures in their proper perspective, however, it is necessary to compare the totals for the first five months of the year with those for the corresponding periods of last year and 1932. Such a comparison reveals that exports of chemicals, drugs, dyes and colours are still lagging behind those of 1932, the total to date being £8,033,255, against £8,041,188 in the first five months of 1932 (a decrease of £7,933) and against £7,399,267 in the same period of 1933 (an increase of £633,988).

Imports during the first five months of the current year totalled £4,759,331, against £4,299,188 two years ago (an increase of £460,143) and against £3,795,842 last year (an increase of £963,489). Re-exports, which are always liable to considerable fluctuation from month to month, show a total of £534,870 to date this year, compared with £307,218 in the first five months of 1932 (an increase of £227,652) and £209,935 in 1933 (an increase of £324,935). Re-exports are defined in the returns as goods which are exported in the condition in which they were imported, or which have been merely sorted, repacked or blended in the United Kingdom so as not to alter their character. Goods which after importation have been subjected in the United Kingdom to an operation which has altered their composition, character or, to an appreciable extent, their value and are then exported, are included in the general term "Exports."

Benzol Refining

THE Newcastle Gas Co. is to be congratulated upon its efforts, described in THE CHEMICAL AGE of June 16 (page 511), to recover carbon disulphide from benzol by a chemical method. Hitherto the distillation method has always proved adequate, sufficient benzol forerunnings being collected to be worked up separately. CS₂ has been estimated by the xanthate method for many years and we do not doubt that this is not the first attempt to purify the benzol by means of this reaction. Previously, however, ethyl alcohol has been

used instead of methyl alcohol. With the possibility of manufacturing methyl alcohol from coal gas, the xanthate process may well become more attractive. Not the least valuable part of the table in question is the careful investigation that has been made into the course of the reaction. If methanol can be produced at a cost not greatly in excess of that of benzol so that some loss of methanol into the benzol is not a serious matter the process may well become attractive when the benzol is to be used for power purposes; we do not imagine the dyeworks will greatly appreciate having contaminated benzol thrust upon them.

The cost figures showing that each 0.1 per cent. of carbon disulphide removed costs between 0.4d. and 0.6d. are quite encouraging, even though at this stage in the development of the process they mean an expenditure of $\frac{1}{2}$ d. per gal. We should be disposed to put this figure higher, since a washing process that involves watching the course of a chemical reaction is likely to make greater demands upon the time of the works chemist for supervision than a simple distillation process in which the cut is made at a well-defined arbitrary point easily understandable by the workmen. We are at present not wholly convinced that a chemical method is any sufficient improvement to warrant a change in practice.

Use of Unpurified Materials

THE National Benzol Association might consider whether it is really necessary to remove sulphur from benzol to be used for motor spirit. Admittedly where the sulphur content is high there is much to be said for making no change, but there is no need for high CS₂ content if the coal is properly washed before carbonisation. Even with so high a CS₂ content as 1.0 per cent. the total quantity of sulphur discharged per year from the exhausts of all motor cars using it as fuel will be no more than London sends into her atmosphere in three days. From the view-point of public health it can be disregarded. We have frequently heard of motor cars being run successfully on crude benzol, the only objection being an unpleasant smell; there has been no detriment to the car engine, in one instance after two years. Similarly it was always understood that coke oven gas must be purified from sulphur before being used in gas engines, but we have heard of more than one instance in which unpurified gas was successfully used. We suggest that more effort should be made to use unpurified materials than to draw up elaborate

specifications for purity of commercial products. The National Benzol Research organisation and Mr. Hoffert have certainly done something in this direction by allowing the unsaturated hydrocarbons to be retained in motor benzol. Is it quite impossible to go a step further and to allow far more sulphur to be retained?

Gas chemists are interested in the removal of CS_2 from their town's gas and this is a far more serious matter. Gas is burnt in the confined atmosphere of our homes so that CS_2 soon makes its presence felt, not by affecting the human lungs, but by its corrosive effect on the metal fittings. At present the use of activated carbon for extracting benzol provides the best way of removing the CS_2 from the gas, but this increases the benzol chemist's problem of how to treat the higher sulphurised material he recovers as crude benzol. The best way of dealing with the whole sulphur problem in town's gas and gasworks benzol would be to devise some satisfactory method of recovering the whole of the carbon disulphide from the gas before the benzol scrubbers. We commend this problem to research chemists as one which it would be highly profitable to solve. A solution would be welcomed by the whole of the gas industry no less than by the benzol refiner.

The Interpretation of Patents

THE letter from the Follisain Syndicate, Ltd., in THE CHEMICAL AGE last week (page 521) regarding the interpretation of patent specifications is noteworthy as having apparently furnished an instance in which the official abstract has been found wanting. It is a worthy tribute to the work of the Patent Office staff that such an event should be regarded as meriting special notice. To abstract correctly the hundreds of specifications that come within the purview of the office each year must be a task of no little magnitude. The officials cannot possibly be experienced in every trade and cannot be expected to appreciate the finer points upon which each patent is based. This is particularly so since many patents set out to claim so much that the real purpose of the invention is lost amid a mass of claims.

Often have we marvelled that the Patent Office can pick its way so carefully and skilfully amid the conflicting patents of rival inventors as to be rarely convicted of a blunder of even the smallest magnitude. The chemical industry in particular owes quite a considerable debt to the patent office staff. The work of the department is highly important since if a claim is misunderstood—and patent jargon is not the clearest of English literature—it may act detrimentally to the interest of the inventor concerned, or of another inventor who may be discouraged from taking out a patent under the mistaken idea that his process has already been anticipated.

Men and Machinery

THE offices from which THE CHEMICAL AGE is published have, for the past seventeen years, been open from Monday to Friday only, so we ourselves require no conversion to the five-day week idea to which Lord Trent is giving his powerful support. As chairman of Boots Pure Drug Co., Ltd., Lord Trent is of the opinion that the data that will be obtained from the five-day week experiment at Nottingham will not only be of value to the company in determining hours

of work for the future, but will throw a useful light on the whole question of hours and leisure. Something like a sixth of the wage-earning population is permanently unemployed and the purchasing power of the public as a whole is consequently substantially lower than it might be, and falls short of the nation's powers of production. There may be many contributory causes of this phenomenon, which has been concisely described as poverty in the midst of plenty, but the chief factor is that there is not enough money in circulation. As things are to-day an extra pound in the pocket does more good to trade than two pounds in the bank. There are people who say that our monetary system is to be blamed for this shortage of purchasing power, and others who say that world conditions, with their cramping effect on export trade, are the cause of much of our trouble. But the most obvious point is that the proportion of machines to men has steadily increased. When a firm employs a man it is employing a purchaser. Machines do not buy food, clothes, and chemical products, but men and women workers do, so that when employers replace human beings by a machine they are doing something to reduce purchasing power until those people are again employed. The alternative—and, so far as Lord Trent can see, the only practical alternative—is the gradual reduction of human working hours without a corresponding reduction in wages.

Not a Matter for Politicians

If everybody worked for five days instead of five and a half, employment would, no doubt, be rather better spread. More people would be brought into employment, there would be more leisure for the individual and the general purchasing power of the community would be increased. In this way machinery might be so employed as to combine increase of producing power with simultaneous increase of consuming power. Lord Trent is satisfied that any practical step that Boots Pure Drug Co., Ltd., as a firm could take to accelerate this process would not only confer a boon upon workers but would help to enlarge the volume of purchasing power upon which the growth of their own business depends.

This is a matter for industry itself rather than for politicians, for adjustments of this kind depend upon a variety of complicated conditions which differ widely not alone as between one industry and another but even between one department and another in the same firm. To impose from outside any general regulations before the possible effects have been thoroughly tested out might easily result in chaos. Vague talk of a universal 40-hour week all over the world is indulged in only by theorists who can have not the remotest conception of the actual conditions of industry. A point which should not be lost sight of, and one which Lord Trent was careful to emphasise in his speech at Nottingham, is that the welfare of the wage earners is entirely dependent upon their employers' power to sell. Wages are paid out of sales, and out of nothing else. Sales are the test which must be applied all the time, and it is a test which certainly cannot be applied from Whitehall, much less from Geneva. As "The Independent" pointed out last Saturday, any such rigid arrangement as politics can alone supply would do more harm than good.

The Determination of Nitrogen Contents for Technical Purposes

By JULIUS GRANT, Ph.D., M.Sc., F.I.C.

THE determination of nitrogen is an analytical method which is common to the control of almost all industrial processes. In some (e.g., in the fertiliser and food industries) it is of more importance than in others, but every laboratory is faced at some time or other with the necessity of being able to make determinations of nitrogen contents rapidly and accurately. Some recent publications on the matter are therefore rather disturbing, since they imply that certain of the existing variations of the well-known Kjeldahl method give inaccurate results, and as these must have been the basis of innumerable data, many of them of fundamental importance, the question is worthy of some consideration. Unfortunately it is not possible to provide a check on the nitrogen content of every substance; the classical Dumas method is the only reliable means of doing so, and it is long and difficult to perform satisfactorily. It has therefore frequently been assumed that the modification of Kjeldahl's method which gives the highest nitrogen figure is necessarily the most accurate; this, as we shall see below, is not justified.

Old and New Methods

In Kjeldahl's original method, sulphuric acid was used as the digesting liquid, with potassium permanganate to produce the final oxidation. In Gunning's modification potassium and copper sulphates were used with or without the permanganate, whilst the feature of the Christensen-Fulmer method is the use of hydrogen peroxide to give a final touch to the oxidation process. R. S. W. Thorne ("J. Inst. Brewing," 1932, 38, 23) found that none of these alternatives gave consistent results (compared with the Dumas method) in the case of brewing materials such as yeast and wort. Variations in working conditions, such as in times and quantities, produced no improvement, although it was noticed that the hydrogen peroxide method seemed to give the highest results, and that an optimum quantity of this reagent appeared to be necessary. These conclusions were, in the main, confirmed by A. E. Case and W. J. Price (*ibid.*, 1933, 39, 35).

The whole question was, however, subsequently closely examined by J. S. Ford, A. Tait, L. Fletcher, J. Spiers and W. J. Mitchell (*ibid.*, 1933, 39, 472) who came to the conclusion that if the details of technique proposed by the originators of the methods were followed, many of the divergencies disappeared. Thus, for example, the results given by the Christensen-Fulmer method were found to be independent of the amounts of hydrogen peroxide and sulphuric acid used, and it gave the same results as the copper sulphate method (except for certain alkaloids, which gave low results with the latter); yeasts, barleys and worts, however, gave good results (unless relatively large amounts of nitrates were present), by all three methods. These results were confirmed, and an explanation of the deviations experienced by previous workers was provided by W. A. Davis, J. G. Maltby and F. E. Salt (*ibid.*, 1933, 39, 577). In particular, it was pointed out that hydrogen peroxide may contain uric or barbituric acid as a stabiliser, and that this would contribute nitrogen to the result to an extent corresponding with the amount of peroxide used; hence the necessity for accurate blank determinations. Incidentally, the use of copper oxide in the Dumas method (which has been regarded as an almost infallible standard) was shown to be unreliable in certain cases as an oxidising medium, and lead chromate was suggested as a preferable alternative.

Selenium Catalysts

It is now necessary to examine the claims of another catalyst, namely, selenium powder or selenium oxychloride. This has been used principally for flour and coal, and has also been the subject of some differences of opinion. Thus M. F. Lauro ("Ind. Eng. Chem." Anal. Edit., 1931, 3, 401) found that the digestion mixture "cleared" (i.e., became colourless) much more rapidly with this reagent than when mer-

curic oxide, with or without potassium sulphate, was used, although a long period of digestion after clearing was still found necessary in order to complete the oxidation. Other advantages attributed to selenium are the fact that there is no necessity to precipitate it before digestion (as with mercury), and that less expense is involved, since only 0.1 or 0.2 grm. of material is required for each digestion. H. E. Crossley ("Trans. Soc. Chem. Ind.," 1932, 51, 237) reached these conclusions using coal and coke, and R. M. Sandstedt ("Cereal Chem.," 1932, 9, 156) also confirmed them from determinations of the protein contents of flours and brans.

On the other hand, we have rather conflicting evidence from the work of C. F. Davis and M. Wise (*ibid.*, 1933, 10, 488) and of R. A. Osborn and A. Krasnitz ("J. Asso. Off. Agric. Chem.," 1933, 16, 110) who obtained in each case the acceleration of the clearing period, but did not consider that the advantages of selenium were sufficient to recommend its use. The work of the latter observers is particularly important, since it was applied to glutens as well as to flours and involved comparisons of selenium powder, the oxychloride, mercuric oxide and copper sulphate.

Some Comparisons

Finally, the writer has had opportunities of carrying out from time to time comparisons of these different catalysts, and he has found that apart from the saving in time (which is minimised by the uncertain length of the interval which must be allowed to elapse after clearing for completion of the oxidation) selenium offers no advantage either in accuracy or ease of technique. The method actually preferred is one which gives very satisfactory results, and which, strangely enough, is not mentioned by the numerous workers cited above, although the writer had always assumed it to be well known. It involves the use of potassium bisulphate as a means of raising the temperature of the digestion mixture, and a small globule of metallic mercury as catalyst; mercury in solution is removed subsequently by precipitation as sulphide, the hydrogen sulphide being blown away in a stream of air, but there is no difficulty here if the operation is properly carried out. The method has been found to be more rapid than the copper sulphate or hydrogen peroxide processes, and the complete digestion takes very little longer than when selenium is used, although the clearing time may be less. Except in certain cases (e.g., of fertilisers and cattle foods, in which sampling cannot be neglected as a more important source of error) it has never given results which are open to suspicion.

Checking Results

If it is a question of checking such results, particularly when small quantities of material or rapidity of working is involved, H. Ter Meulen's method ("Rec. Trav. Chim. Pays-Bas," 1924, 40, 643; 1930, 49, 396) is to be recommended. In this method about 50 mgrms. of the substance under examination is mixed with a nickel catalyst and is heated in a stream of hydrogen, when all the nitrogen present is reduced to ammonia which may be determined by passing the mixture of ammonia and hydrogen into an excess of a standard solution of alkali. Here again the literature contains both favourable and unfavourable reports (*loc. cit.*) of which it has been possible to confirm only the former. Thorne condemns it, Davis, Maltby and Salt use it with reservations, whilst Ford and his co-workers mention it very favourably. The writer can vouch that if proper attention is paid to the experimental details as specified by Ter Meulen the method fulfils all the claims made, although (unlike Ter Meulen) he has never been able to obtain results higher than those given by the modified Kjeldahl method described above. Other workers have also failed to find this divergency, and it may be that the explanation is to be found in Ter Meulen's technique in carrying out the Kjeldahl method.

Possible Production of Elements of Atomic Number Higher than 92

By Professor E. FERMI

This article is reprinted from the current issue of "Nature." Professor Fermi, of the Royal University of Rome, claims to have discovered a new element of atomic number 93, to which reference was made in "The Chemical Age," June 9, page 505.

UNTIL recently it was generally admitted that an atom resulting from artificial disintegration should normally correspond to a stable isotope. M. and Mme. Joliot first found evidence that it is not necessarily so; in some cases the product atom may be radioactive with a measurable mean life, and go over to a stable form only after emission of a positron.

The number of elements which can be activated either by the impact of an α -particle (Joliot) or a proton (Cockcroft, Gilbert, Walton) or a deuteron (Crane, Lauritsen, Henderson, Livingston, Lawrence) is necessarily limited by the fact that only light elements can be disintegrated, owing to the Coulomb repulsion. This limitation is not effective in the case of neutron bombardment. The high efficiency of these particles in producing disintegrations compensates fairly for the weakness of available neutron sources as compared with α -particle or proton sources. As a matter of fact, it has been shown that a large number of elements (47 out of 68 examined until now) of any atomic weight could be activated, using neutron sources consisting of a small glass tube filled with beryllium powder and radon up to 800 millicuries. This source gives a yield of about one million neutrons per second.

All the elements activated by this method with intensity large enough for a magnetic analysis of the sign of the charge of the emitted particles were found to give out only negative electrons.

In several cases it was possible to carry out a chemical separation of the β -active element, following the usual technique of adding to the irradiated substance small amounts of the neighbouring elements. These elements are then separated by chemical analysis and separately checked for the β -activity with a Geiger-Müller counter. The activity always followed completely a certain element, with which the active element could thus be identified. In three cases (aluminium, chlorine, cobalt) the active element formed by bombarding the element of atomic number Z has atomic number $Z - 2$. In four cases (phosphorus, sulphur, iron, zinc) the atomic number of the active product is $Z - 1$. In two cases (bromine, iodine) the active element is an isotope of the bombarded element.

This element seems to show that three main processes are possible: (a) capture of a neutron with instantaneous emission of an α -particle; (b) capture of the neutron with emission of a proton; (c) capture of the neutron with emission of a γ -quantum, to get rid of the surplus energy. From a theoretical point of view, the probability of processes (a) and (b) depends very largely on the energy of the emitted α - or H -particle; the more so the higher the atomic weight of the element. The probability of process (c) can be evaluated only very roughly in the present state of nuclear theory.

It seemed worth while to direct particular attention to the heavy radioactive elements thorium and uranium, as the general instability of nuclei in this range of atomic weight might give rise to successive transformations. For this reason an investigation of these elements was undertaken by the writer in collaboration with F. Rasetti and O. D'Agostino. Experiment showed that both elements, previously freed of ordinary active impurities can be strongly activated by neutron bombardment. The initial induced activity corresponded in our experiments to about 1,000 impulses per minute in a Geiger counter made of aluminium foil of 0.2 mm. thickness. The curves of decay of these activities show that the phenomenon is rather complex. A rough survey of thorium activity showed in this element at least two periods.

Better investigated is the case of uranium; the existence of periods of about 10 sec., 40 sec., 13 min., plus at least two more periods from 40 minutes to one day is well established. The large uncertainty in the decay curves due to the statistical fluctuations makes it very difficult to establish whether these periods represent successive or alternative processes of disintegration.

Attempts have been made to identify chemically the β -active element with the period of 13 min. The general scheme of this research consisted in adding to the irradiated substance (uranium nitrate in concentrated solution, purified of its decay products) such an amount of an ordinary β -active element as to give some hundred impulses per minute on the counter. Should it be possible to prove that the induced activity, recognisable by its characteristic period, can be chemically separated from the added activity, it is reasonable to assume that the two activities are not due to isotopes. The following reaction enables one to separate the 13 min.-product from most of the heaviest elements. The irradiated uranium solution is diluted in 50 per cent. nitric acid; a small amount of a manganese salt is added and then the manganese is precipitated as dioxide (MnO_2) from the boiling solution by addition of sodium chlorate. The manganese dioxide precipitate carries a large percentage of the activity.

This reaction proves at once that the 13 min.-activity is not isotopic with uranium. For testing the possibility that it might be due to an element 90 (thorium) or 91 (palladium), we repeated the reaction at least ten times, adding an amount of uranium $X_1 + X_2$ corresponding to about 2,000 impulses per minute; also some cerium and lanthanum were added in order to sustain uranium X . In these conditions the manganese reaction carried only the 13 min.-activity; no trace of the 2,000 impulses of uranium X_1 (period 24 days) was found in the precipitate; and none of uranium X_2 , although the operation had been performed in less than two minutes from the precipitation of the manganese dioxide, so that several hundreds of impulses of uranium X_2 (period 75 sec.) would have been easily recognisable.

Similar evidence was obtained for excluding atomic numbers 88 (radium) and 89 (actinium). For this, mesothorium-1 and -2 were used, adding barium and lanthanum; the evidence was completely negative, as in the former case. The eventual precipitation of uranium- X_1 and mesothorium-1, which do not emit β -rays penetrating enough to be detectable in our counters, would have been revealed by the subsequent formation respectively of uranium- X_2 and mesothorium-2. Lastly, we added to the irradiated uranium solution some inactive lead and bismuth, and proved that the conditions could be regulated in such a way as to obtain the precipitation of manganese dioxide with the 13 min.-activity, without carrying down lead and bismuth.

In this way it appears that we have excluded the possibility that the 13 min.-activity is due to isotopes of uranium (92), palladium (91), thorium (90), actinium (89), radium (88), bismuth (83), lead (82). Its behaviour excludes also ekacæsium (87) and emanation (86).

This negative evidence about the identity of the 13 min.-activity from a large number of heavy elements suggests the possibility that the atomic number of the element may be greater than 92. If it were an element 93, it would be chemically homologous with manganese and rhenium. This hypothesis is supported to some extent also by the observed fact that the 13 min.-activity is carried down by a precipitate of rhenium sulphide insoluble in hydrochloric acid. However, as several elements are easily precipitated in this form, this evidence cannot be considered as very strong.

The possibility of an atomic number 94 or 95 is not easy to distinguish from the former, as the chemical properties are probably rather similar. Valuable information on the processes involved could be gathered by an investigation of the possible emission of heavy particles. A careful search for such heavy particles has not yet been carried out, as they require for their observation that the active product should be in the form of a very thin layer. It seems therefore at present premature to form any definite hypothesis on the chain of disintegrations involved.

Stock and Stores Control in the Chemical Industry

By S. HOWARD WITHEY, F.C.I.

IN the interests of economy and efficiency, the purchasing department of the chemical works should be subjected to an effective control calculated to prevent the mis-application of material, and to avoid excesses and irregularities, the internal system commencing directly an order is placed, and maintained in operation until such time as the materials cost has been allocated against specific jobs or contracts. Before actually giving out orders for the supply of industrial solvents, acid resisting cement, drums, hampers, etc., many manufacturers of chemical products make a practice of obtaining several quotations, the purchases being governed largely by the prevailing market prices, as well as by the state of the order book and any special local circumstances, and although there is no standardised pattern of order form, it is always advisable to make known to suppliers and purchasing agents that any deviation from the particulars as enumerated on the orders, will be entirely at their own risk, except when alternative stores or other variations have been specifically authorised.

Signed Orders

Each order form should be signed by the proprietor, one of the partners, or by a director, as the case may be, and as a rule it is found convenient to use a duplicate book consisting of thin tissue leaves, each alternate sheet being ruled and printed in the prescribed manner, and the remaining leaves constituting authentic copies. Whether the orders should be made out on the pen or the pencil carbon copy principle is really a matter for each individual manufacturer or firm to decide, but in any case the copies should be preserved intact in order to facilitate all future references to details on the part of members of the staff. In some instances, it will be necessary to specify the prices of the goods or articles, or materials or stores ordered, the latest date for delivery, the terms and conditions of payment, or certain other matters, either on the order form itself, or in an accompanying letter, and when dealing with suppliers for the first time, the conditions of business should be very clearly stated or confirmed to prevent any possible misunderstanding.

Cash and Credit Purchases

Industrial and trade purchases usually consist of both cash purchases and credit purchases, that is to say, some materials and stores are bought and paid for at the same time, while other materials and stores are acquired subject to cash settlement at a future date, the proportion which the cash purchases bear to the total turnover varying in individual cases

importance that both the quantity and the quality of all purchases should be carefully checked and compared with the original specifications before taking into stock. After acceptance has been approved, the necessary entry can be made in the inwards book kept in the receiving department.

Various forms of purchases book are in use at the present time, the number of money columns depending upon the degree of analysis required. A few years ago, it was the custom to keep what was referred to as the "guard book," into which were pasted all the invoices received from suppliers, the forms having been first folded and endorsed with the date, the name of the creditor, and the invoiced cost price. Down the right-hand margin of this book was ruled a single money column, into which the net invoiced cost prices were extended, and although this method of recording the credit purchases enabled any details to be referred to, when needed, the bulky nature of the book and the impossibility of sub-dividing the clerical work, gradually resulted in the adoption of the purchases book method, whereby each transaction could be recorded to show the date of the invoice or other debiting document, the name and address of the suppliers, brief details of the materials or stores bought, the cost price of each different kind or description, and the total cost. At some works this method is still adopted, each amount shown in the "total" column being posted direct to the credit side of the particular personal account kept in the purchases or bought ledger, while the monthly totals are transferred to the debit side of one general purchases account kept in the impersonal ledger. In those cases, however, where the purchases fall under several distinct headings, it is usually found much more satisfactory to use an analytical purchases journal provided with a number of columns for classification under definite heads.

A Reliable Internal Check

Apart from the entries made in the ordinary books of account, however, the purchases should be subjected to a reliable internal check, and this can best be effected by keeping separate stores accounts. To give the best results a stores order book should be kept, showing the stock requirements from time to time, with columns for the insertion of the date; brief particulars of the stock needed; the name of the department; the quantity, number or weight required; the initials of the person authorising the order; and for any remarks or special observations which may be connected with the transactions. A good general form of ruling for this book, and one which is capable of modification to satisfy any special requirement, is indicated below:—

CHEMICAL STORES ORDER BOOK

Date.	Particulars of Stores Required.	Department.	Quantity Needed.						Order Authorised by	Remarks.

according to the size of the business and the nature of the product or products made. When a remittance is forwarded with an order, an entry will be made on the credit side of the general cash book, or in the cash payments book, giving the date and brief particulars, and the amount should be posted without delay to the debit side of the particular stock or trading account, but the purchase of materials or stores on a credit basis necessitates no entry in the books of account until they actually arrive on the premises. While some engineers make a practice of refusing to accept stores unless a delivery or advice note is produced, showing the original order number and other details, the maintenance of such a rule is often extremely inconvenient, and in some instances quite impossible; nevertheless, it is of the utmost

A separate section could also be provided for office use, comprising columns for the insertion of such details as the date on which each order was placed; the name of the suppliers; the date on which the stores actually came to hand; and the page or folio on which the entry was booked in the inwards book. Having regard to the fact that a small turnover usually absorbs much more capital, relatively speaking, than does a large turnover, the stock under any given heading should never be allowed to dwindle below a certain fixed minimum before making an entry in the stores order book. The invoices received from suppliers should be stamped by means of a rubber stamp or other suitable impression, and when the details have been checked and compared, particulars can be entered in the Stores Received Book ruled with

columns or sections for the insertion of the date of receipt; the number of the order; the name of the suppliers; a description of the stores received, including the quantity, weight or number; the unit price; and the total cost.

While it is inadvisable to permit the stock to fall below the minimum which experience and circumstances prove to be essential to carry, any ill-advised buying may result in waste in the works and this may easily have very disastrous consequences. Indeed, it is from the viewpoint of the avoidance of waste, and the general economy in production, that the efficiency of the works records should be judged, and by means of cards kept in a drawer, or loose sheets bound

corded on the respective stock cards, it will be possible to ascertain at any time both the quantity and the value of the stock on hand under a given heading, thereby avoiding the need for constant stocktaking operations, although the compilation of an inventory at least once every year, based on an actual count, will be absolutely essential in order to arrive at a reliable figure for inclusion on the assets side of the balance sheet, and to enable adjustments to be made in the book records. Specimen rulings for the Stores Received Book and the Stores Issued Book, are given below:—

When liquid stores are weighed out in small quantities from the bulk, it is advisable to add a small percentage—

CHEMICAL STORES RECEIVED BOOK.

Date Received.	Order No.	Received from	Description of Stores Received.	Quantity Received.					Unit Price.	£ s. d.		

CHEMICAL STORES ISSUED BOOK.

Date Issued.	Requisition No.	Issued to	Particulars of Stores Issued.	Quantity Issued.					Unit Price.	£ s. d.		

in book form, the stock may be grouped under appropriate headings, each card or sheet giving all the essential details and the records arranged in strict alphabetical sequence.

As certain materials and stores will be frequently moved from one workshop or stores to another, involving fresh instructions to the storekeeper, written requisitions should be used to support the entries made in the issued book. In this way, the materials cost can be correctly allocated to the different operators, and although there are many different forms of requisition, the only essential requirement is to show the name of the particular department or job. If the issues made from stock from time to time have been correctly re-

such as 2½ per cent.—to the quantities issued, as shown in the issued Book, to cover wastage, spillage, evaporation, etc. Each item recorded in the Received Book should be transferred to the left-hand or debit side of the specific stores account kept in the works ledger, while each item recorded in the Issued Book will be shown on the credit side of its proper account. Particulars of all materials and stores rejected and returned to the suppliers may be passed through the outwards book kept primarily for recording the value of empty crates and packing cases, etc., both the quantity and the value of the returns being transferred to the credit side of the particular stores accounts.

International Conference on Physics

Preliminary Notice

IN response to an invitation from the Royal Society the International Union of Pure and Applied Physics will meet in London, October 1—6, 1934. The meeting will take the form of a joint conference of the International Union of Pure and Applied Physics and of the Physical Society, held under the presidencies of Professor Millikan and Lord Rayleigh. The details of the conference will be arranged by a committee of the Physical Society and of the British National Committee for Physics. The business will include a discussion on nuclear physics—the first of its kind to be held in London—and a discussion on certain aspects of the theory of the solid state of matter. There will also be presented to the conference a report from the Symbols, Units and Nomenclature Commission of the International Union of Physics, together with other business of the Union.

By the courtesy of the president and managers of the Royal Institution the London meetings will be held in the Lecture Theatre of the Institution. At the invitation of Lord Rutherford, the conference will meet on one day at the Cavendish Laboratory, Cambridge.

The discussion on "Nuclear Physics" will start with an opening survey by Lord Rutherford, and will cover cosmic radiation, β -ray transformation of radio-active elements, artificial transmutations (α -rays and neutrons, protons,

diplons, new types of radio-activity), and constitution of atomic nuclei.

The discussion on "Certain Aspects of the Theory of the Solid State of Matter" will be opened by Sir William Bragg, and will deal with interatomic forces (electrovalent linkings, covalent linkings, van der Waals attractions), and the probable or possible existence of a secondary structure in crystals, coarser than the fine structure which is detected by X-rays, and its relation to physical properties.

The members of the conference will consist of official delegates of the National Unions adhering to the International Union of Physics and persons invited by the president, in accordance with the Statutes of the International Union, to take part with the delegates in the discussions of the conference; Fellows of the Royal Society and Fellows and students of the Physical Society; together with others interested in the discussions of the conference and desirous of participating therein. Persons desiring to attend the conference should send their names to the secretaries of the conference, Burlington House, Piccadilly, London, W.1, before September 1.

It is proposed to issue one or more volumes containing the papers and abstracts officially communicated to the conference together with some account of the discussions and the proceedings generally.

Lubricating Grease: Its Manufacture and Qualities

Research Opportunities in Every Direction

LUBRICATING oils have received more attention and are more fully understood than greases, said Mr. H. S. Garlick, F.I.C., B.Sc., when introducing his paper on "Lubricating Grease" at a meeting of the Institution of Petroleum Technologists, on May 8. The reason is that there is not the possibility for so wide a variation in the different types of lubricating oils as there is in greases. Moreover, the physical characteristics such as viscosity, pour test and flash point by which lubricating oils are commonly classified have been standardised and rendered capable of checking in a ready and practical manner. On the other hand, with greases the meaning and value of such properties as consistency, hardness, melting-point and colour are frequently ambiguous to many, and are very often difficult to check or even define.

The ingredients used in the manufacture of soap-thickened oils include the saponifying agent or metallic base, the saponifiable fat and the mineral oil. The manufacturing procedure, in general, is to heat the fat in contact with the metallic base until the saponification reaction is completed. The mineral oil is then slowly worked into the hot soap until a grease of the desired consistency is made. By varying the raw materials and method of manufacture greases may be produced in many types, each having specific characteristics. In turn, by varying the soap content but otherwise using the same materials, a range of greases may be manufactured having similar characteristics but varying in hardness.

The Saponifying Agent

The type of saponifiable oil or fat is secondary in importance, to the saponifying agent when considering the construction of a grease. The more specific properties such as texture, degree of metallic adhesion and cohesive character of the grease body are controlled to a certain extent by selection of the fatty ingredient, but it is the saponifying agent or metallic base that determines the type of soap, thereby fixing the general physical properties of a grease and limiting the uses to which it can be put.

Calcium or lime soap greases are probably used to a greater extent than any other type of soap-thickened lubricant. They may be sub-divided broadly into cup greases (the soap of which is made by the interaction of lime with the ordinary types of fats and fatty acids) and sett greases (containing the lime soap of the acids present in rosin and rosin oil).

From a colloidal standpoint cup greases are emulsions of mineral lubricating oil and water, stabilised by lime soap. The external phase is the mineral lubricating oil; the water is the inner or dispersed phase. Calcium oleate and calcium stearate are, from a practical consideration, insoluble in water, but have a slight solubility in mineral lubricating oil at normal temperatures. On heating mineral lubricating oil and the calcium salts of the high fatty acids, the soaps will be dissolved and on cooling a gel will be obtained. This mixture, however, is unsatisfactory for lubrication purposes because of its tendency toward "sweating" oil and its instability to mechanical agitation.

Production of Cup Grease

If water is introduced into the mixture of calcium soap and mineral lubricating oil at a temperature of 150° to 200° F., there may be obtained a stable product which we call a cup grease. The minimum quantity of water necessary to stabilise a cup grease is normally 2 to 3 per cent.

The sett greases, which are mixtures of the calcium soaps of rosin acids and various grades of mineral lubricating oils, constitute the cheaper grades of semi-solid lubricants. They are important in that they are satisfactory for the lubrication of rough machinery and heavy bearings operating at slow speeds. They are also extensively used for gear and wagon axle lubrication. These greases invariably contain an excess of the saponifying agent which, in the form of hydrated lime, is insoluble in the grease. This excess constitutes an abrasive element, and such greases are therefore unsuitable for lubricating accurately machined parts.

Sett greases are almost invariably made by mixing while cold, or at a temperature below 150° F., mineral lubricating oil, rosin oil and a lime mixture known as "sett." The sett is normally an emulsion consisting of mineral oil, water, hydrated lime, and a small quantity of the calcium soap of rosin acids which promotes emulsification. In certain circumstances, the sett may simply comprise a suspension of finely divided hydrated lime in a mineral oil of low viscosity. In both cases, if the lime is not held in a fine state of division in the emulsion, the reaction with the major portion of the rosin oil in the final mix will be uneven and slow, resulting in a lumpy grease and one which is prone to separate. The final mixture will normally solidify in a few minutes, and providing that proper precautions have been exercised in the selection of the various stocks, that the ingredients have been mixed in the correct proportions and that the mixing has been thorough, the resultant product will have a satisfactory consistency and be free from lumps.

Soda Base Greases

Soda base greases are mixtures of mineral lubricating oil and the sodium soaps formed by the saponification of any of the natural fats or fatty oils with caustic soda. In those greases containing water, an emulsion of the oil in water type exists. However, many soda soap greases are more or less completely dehydrated and are not emulsions but intimate mixtures of soap and oil. From a practical consideration, they are mineral oils sorbed by a lattice structure soap, giving a plastic solid. Soda soap greases may readily be recognised by rubbing a small portion in the palm of the hand with water. The appearance of the grease is changed and the water soluble soap that is present is readily seen.

As ingredients in grease manufacture, aluminium soaps are gaining in popularity now that intensive study has revealed the best means for their utilisation. Hitherto they have presented a most perplexing problem to the grease maker owing to the fact that every ingredient apparently plays a definite part in shaping the physical properties of the resultant product. The aluminium soap of stearic acid, when incorporated with a low viscosity mineral oil, yields a grease of low cohesive character, as evidenced by its short shear and buttery texture. The aluminium soap of oleic acid, incorporated with a similar oil, yields a product of high cohesive character and pronounced rubbery texture. When incorporated with a high viscosity oil, aluminium soap yields a grease of softer consistency than when incorporated with a low viscosity mineral oil. The rate of cooling has an important bearing on the grease texture and consistency, as also have the method of dissolving the soap, the rate of heating and the maximum temperature to which the oil and soap are heated.

Importance of Consistency

In selecting a grease for a definite type of lubrication, it is essential that the consistency be carefully considered. Where the grease has to be fed through long lengths of piping, a grease of a short shear should be chosen, as a grease of fibrous or rubbery consistency would offer too much "drag" or resistance to flow. An open bearing may be well adapted for lubrication by a dehydrated grease block, and in all cases effective lubrication and minimum consumption will depend to a great extent upon the consistency of a grease. With oils consistency would be defined by viscosity, and with greases at the present time the term consistency may now be regarded as "the degree of solidity" of a grease (Klemgard), and embraces both texture and hardness. Various methods have been proposed and many instruments devised for determining the consistency of particular types of grease or for determining consistency in terms of some particular property of the lubricant.

The melting-point of a grease is one of the controlling factors in grease lubrication. It is quite obvious that if a bearing temperature is 250° F. a grease having a melting-point of only 200° F. should not be used. On the other hand, the

tendency is to attach far too much importance to melting-point. The fact that two greases have the same melting-point does not indicate that they can be used for the same service. Very few greases have a definite melting-point, but gradually soften as the temperature is raised. This can be demonstrated by determining the consistency of a grease by the A.S.T.M. method over a range of temperature. The grease will soften as the temperature is raised, until it becomes so soft or semi-fluid that the consistency cannot be determined.

The stability of a grease in storage depends primarily upon the quality of the ingredients used in manufacture and the efficiency of the manufacturing process. Greases containing poor quality or unstable fats are liable to go rancid on keeping or to oxidise and change colour. The presence of excessive quantities of free fats or free fatty acids in the finished grease are liable to promote this action. On the other hand, with cup greases especially, the presence of a large quantity of free lime will cause separation of the soap from the mineral oil during storage.

The natural colour of lubricating greases depends entirely upon the colour of the fats and the mineral oils used in

their manufacture. The colour of all fats is liable to slight variations which may alter the depth of colour in the finished grease. Greases may change colour during storage due to several reasons. Practically all greases mature with ageing, and in doing so they tend to become clearer and more transparent. This results in the colour of the mineral oil becoming more apparent, so that the older matured grease appears a different colour from the freshly made grease. Oxidation and the drying out of moisture are also responsible for colour changes. The majority of greases will bleach if kept in strong light, so that a sample that has been retained for some time will often be appreciably lighter in colour than the freshly made grease. Although colour, to a certain extent, indicates the quality of the constituents of a grease, it is by no means a sure guide. A dark coloured grease may contain highly refined products, yet owing to the temperature of manufacture a darkening of colour will be brought about that is unavoidable.

There are opportunities for research in every direction in connection with grease, said Mr. Garlick, since less attention has been paid to this subject than to any other branch of petroleum technology.

The Royal Society

Speed of Chemical Reactions

A DISCUSSION on methods of measuring and factors determining the speed of chemical reactions was held at a meeting of the Royal Society on June 14

In his opening address, Professor A. V. Hill, F.R.S., said the discussion was planned on lines leading ultimately to an attack on biological problems; the methods and results, however, are necessarily chemical and physical. To limit its scope, and to keep it within range of biological phenomena, reactions in an aqueous medium must be regarded as of chief interest. The study of chemical velocity is important in biology for the special reasons, namely, that the systems involved, though heterogeneous, are so small that diffusion may be relatively unimportant. In all diffusion equations the quantity involved is kt/l^2 , where k is diffusion constant, t is time (sec.), l is distance (cm.). Taking k as typically of the order of 10^{-5} , l as 10^{-4} – 10^{-5} cm., t is of the order of 10^{-3} to 10^{-5} sec. Clearly reactions of any but the highest velocities inside single cells are not much hindered by diffusion unless impermeable surfaces intervene. In such small systems, moreover, surface phenomena and, as the late W. B. Hardy would have insisted, surface effects transmitted to a distance, are bound to be relatively more important.

The Time Scale

The "time-scale" of vital phenomena is a matter of fundamental significance. The velocity of transmission of a nerve impulse may vary in the ratio of 10^4 to 1, from one animal to another; the speed of muscular contraction in the same ratio in fibres structurally similar and of the same size. The latter variation at least must be a matter of physical or chemical difference of (as yet) quite unknown nature. The rate of resting metabolism varies greatly from one warm-blooded animal to another (particularly from small to large), as also does the rate of growth and the rate of senescence. A rise of temperature quickens vital processes as it does most chemical reactions, but its effect is not the same on them all. Consequently a constant temperature is necessary (as in warm-blooded animals) not only for a constant time-scale but for a constant relation between the several functions. Other agencies, *e.g.*, drugs or ions, affect the speed of frequency of vital reactions, perhaps, however, by altering the level at which periodic instability is attained in some chemical system continuously running in one direction.

The participation of enzymes, important as it is, is not the only factor. The loading and unloading of O_2 and CO_2 by the blood, in lungs and tissues involve the accurate adjustment of a number of reactions, only one of which is known to depend upon an enzyme. The great increase in the heat

production of a resting muscle caused by keeping it stretched, and the fact that the amount of energy liberated by a contracting muscle (and therefore the velocity of the chemical reaction involved) may be greatly diminished when the muscle is allowed to shorten without load, but increased when mechanical work is done, may depend upon the properties either of oriented molecules in surfaces or of the organised system, whatever it is, whose existence is shown by double refraction, but scarcely upon those of enzymes alone.

It seems likely that all nervous transmission across synaptic boundaries (discontinuities between conducting cells) is associated with the rapid liberation, and the equally rapid destruction, of specific chemical substances. With acetyl-choline the process of destruction is diminished or prevented by a low concentration of eserine—whether by its effect on an enzyme, or in some more direct way.

Velocity of Ionic Reactions

The electrical phenomena characteristic of all vital activity, and particularly of the transmission of messages, raise the question of the velocity of ionic reactions. Some of the electrical phenomena are undoubtedly equilibria—*e.g.*, the "injury" potential of non-medullated nerve varies with the logarithm of the K ion concentration. Others—the "action current" for example—clearly are not equilibria. Even if ionic processes are extremely rapid—and are they necessarily so when enormous molecules are involved?—may they not be conditioned, as in the case of the bicarbonate ion, by non-ionic processes occurring at some stage in the reaction? The great effect of light on the velocity of the $COHb \rightarrow CO + Hb$ reaction suggests that similar reactions in solution should be explored. The speed may be altered if the molecules involved have recently taken part in another reaction. This might provide a mechanism for synthesis. For example, if the velocity of reaction of A with B recently formed, were considerably different from that of A with B formed long before, the equilibrium of the reaction $A + B \rightleftharpoons AB$ might be very considerably displaced by the use of recently formed B. Many of the substances involved in vital activity exist only for a short time in intermediate reactions. May these molecules during their short existence possess special properties and so pass in directions and with velocities otherwise not possible? Living objects show the kind of molecular regularity which is revealed by X-ray analysis. The rate of formation of such regularities, whether in surfaces or in bulk, and the rate of transformation from one regular state to another must depend upon molecular constitution in ways not yet known.

Stages in the Manufacture of Oilskins

The Phenomenon of "Tackiness"

It is common knowledge that when a film of linseed oil is exposed to the atmosphere it absorbs oxygen, gives off reaction vapours, increases in weight and finally dries to a film possessing elastic and waterproof qualities. This characteristic of linseed and other drying oils is utilised in the manufacture of oilskins, said Mr. J. Milligan, when reading a paper on "The Manufacture of Oilskins" at a meeting of the Oil and Colour Chemists Association, on April 12.

Japanese silk, Egyptian cotton cambrics and American cotton wigans and ducks are chiefly used as the fabric basis. Linen is not much used, and wool and silk, so far, only in unlined linings. The normal process of manufacture of oilskin garments is divided into five stages:—(1) Impregnation of the fabrics with a drying oil, *i.e.*, saturating the fibres and filling the interstices between the yarns, so that the fabric is proof. (2) Seasoning the impregnated fabric, *i.e.*, allowing it to hang in a well ventilated room for a period of from three to four weeks. (3) The proofed and seasoned cloth is then cut and sewn into garments. (4) The made-up garment is coated on the face or outside with several applications of proofing, with stoving between each application; the object of this treatment is to fill the perforations in the impregnated cloth made by the sewing needles and to give the face side of the fabric a continuous waterproof skin. (5) The finished garment is seasoned by hanging in a well ventilated stock room.

Old and New Processes

There are two methods of proofing in the impregnation of fabrics with drying oils. The first and older system is known as the mangle or the old mill process. This is essentially an intermittent process and consists in rapidly saturating the fabric with oil, removing the surplus proofing by squeezing between rollers and subsequently hanging the "wet" fabric in festoons in a heated chamber until the proofing is dry. The second and modern process is called the tower system, so termed because an essential part of the plant is a high tower or stoving chamber. The essential features of the process are that it is continuous, the "wet" fabric is not squeezed and higher temperatures are employed than in the mangle process.

Having given this brief outline of the manufacturing processes, Mr. Milligan went on to discuss the behaviour of linseed oil in oilskins and said it is important to appreciate that a dried linseed oil film consists of a solid phase (linoxyn) and a liquid phase (made up of partially oxidised and comparatively unoxidised oils). There is a close relation between these and the "tackiness" which is sometimes experienced with oilskins. Indeed, there are two types of tackiness in oilskins. One is what is termed the initial tackiness, or surface "grip" which is evident in freshly prepared linseed oil films, and which is due to the presence of the liquid phase in the dried film. This tackiness may vary according to the ratio of solid to liquid phase and depending on the factors of driers and conditions of drying. An oilskin manufacturer removes this surface tackiness by an application of water-ammonia-shellac solution, by the introduction of gums or resins to the proofing, or by finishing with tack-free synthetic resin or cellulose ester varnishes. The second and technically more important type of tackiness is styled by the author as "developed tackiness," but industrially it is called "come-back."

Influence of Carbon Black

It is the gradual softening or liquefaction of the dried film and is, in effect, the hydrolysis of the linoxyn part of the film whereby this solid phase becomes semi-liquid and, dispersed in the partially oxidised and less oxidised oils, produces a sticky and relatively non-drying mass.

Speaking of the many interesting points which have emerged from recent tackiness research, Mr. Milligan said it has been found that carbon black in oilskins retards the drying of the linseed oil and it is believed that this is due to the adsorption of drier by the carbon. Again, the tack-free life of an oiled fabric can be prolonged by continual exposure of the film to the atmosphere, Tackiness research has also shown the

powerful tack-developing effect which is produced in some types of oilskin by prolonged exposure to heat and humidity, and in this connection the author showed as an exhibit a sample of liquefied linoxyn obtained by subjecting the linoxyn part of a linseed oil film, *i.e.*, the insoluble portion after 24 hours extraction with methylated ether—to such conditions. A point mentioned in this connection was the greater stability and the reduction of potential tackiness introduced by polymerisation. Much evidence has been collected on this point and the author said it would appear that the stable cross-linked complexes produced in the film structure by relatively high temperature stoving retard the breakdown of the linoxyn.

A Possible Explanation

It was suggested that the following explanation is possibly an accurate reflection of the present position regarding the elucidation of the phenomenon of "developed tackiness." A dried linseed oil film consists of a solid phase (linoxyn) and a liquid phase (partially oxidised and less oxidised oils). The solid phase is produced largely by the oxidation and polymerisation of the mixed triglycerides of linolic acid with two double bonds and linolenic acid (with three double bonds); oxidation probably breaks the chains at the ethylenic linkages and polymerisation introduces stable cross-linked complexes. The softening of a dried linseed oil film is accompanied by a degradation of the linoxyn. Linoxyn (freed from any partially oxidised or comparatively unoxidised constituents) can, in certain cases, be softened by the action of moderate heat and water or water vapour.

The softening, or development of tackiness in dried oil films can be accomplished in absence of air or light (indeed, such conditions may have an accelerating influence in oxidised films) and by heat and humidity (such as obtains in certain tropical countries). An air or comparatively low temperature dried film is more susceptible to develop tackiness than a film dried at over 200° F., *i.e.*, linoxyn produced mainly by oxidation is less stable than linoxyn which possesses the complexes introduced by the feature of polymerisation. The softening of dried oil is, in effect, the hydrolysis of the linoxyn film, whereby this solid phase becomes semi-liquid and, dispersed in the partially oxidised and less oxidised oils, produces a sticky relatively non-drying mass.

Points from the Discussion

The PRESIDENT said the tackiness problem had certainly puzzled a great many people and personally he imagined the paint chemists would wonder why paint films did not go tacky whereas the oilskin did—or at any rate apparently some of them did. Although he believed he had heard of paint films going tacky, it was very infrequent and he rather imagined that the difference was due partly to the difference in the thickness of the film. Undoubtedly in tropical climates it might be difficult to prevent oilskins going tacky although the method of storage was very important. The paper had rather suggested that the question of tackiness is really a question of the hydrolysis of the linoxyn film and it seemed clear that this had something to do with it, but he was not sure that he would agree that it was the complete explanation.

Dr. J. O. CUTTER said the first process mentioned in the paper gave, primarily, oxidation, and it would be interesting to know if the author had any idea as to the quantity of oxygen used per unit molecule of the linseed oil in that process, relatively to the second process which gave primarily polymerisation. In the second process there was the removal of products of decomposition fairly rapidly with, at the same time, a minimum amount of oxidation, but the two processes were quite distinct. Some work in this connection had been done in America and it would be interesting to find out whether Scottish practice was in line with that. He was pleased to see the author took the view that tackiness was due to hydrolysis and it would be useful to know if there was any relationship between the type of film formed by the penetration of moisture and the effect of temperature, and

a pure linseed oil film which will swell in water but will not exhibit any whitening due to the penetration of the water. It was also possible to prepare a film which, on the penetration of water, whitens but does not swell very much. Could the author say whether the film that swells in water eventually becomes more tacky. Was it only where there was capillary penetration of water that the film became more tacky? In the case of tung oil there was a very large resistance to swelling in water and he inquired whether the author had experienced tackiness with tung oil. A short time ago he had tried to break down, by hydrolysis, some tung oil gels, which could be done although it was not easy, and he had also been badly led astray in some early experiments by trying to work in glass and he actually hydrolysed the glass before the tung oil gel.

Mr. T. HEDLEY BARRY said the paper made paint chemists realise that there were aspects of the drying problem which perhaps they did not yet fully appreciate. Undoubtedly it

would be possible to learn a great deal about linseed oil by a more complete study of the problems which had been presented in the paper; at the same time, the conditions of application and the temperatures were so different in the two cases that it was rather surprising in a way that the reaction seemed to assume so very much the same course.

Mr. MILLIGAN said there was no doubt, as the president had hinted, that hydrolysis was not the complete solution, but we were still a long way from understanding the mysteries of the reaction of oil films. The swelling of the outside film and humidity might have something to do with the inside stickiness coming through, as mentioned by the president, because there was no doubt it was possible to get a state of sweating through. In reply to Dr. Cutter, he was not in the position to give figures as to the relative quantity of oxygen used per unit molecule of the linseed oil.

On the motion of the PRESIDENT, a cordial vote of thanks was passed to Mr. Milligan for his paper.

The Analysis of Cotton-Rayon Mixtures

Details of a New Method

THE increasing use of viscose and cellulose acetate rayon in cotton materials and, in particular, the increased use of yarns composed of an intimate mixture of cotton and rayon has led to a demand for methods for analysing such mixtures other than those in which the fibres can be separated by hand and then weighed. It is not difficult to determine the amount of acetate rayon in a textile material since it can readily be separated by dissolution in acetone, but it is otherwise with mixtures of cotton and viscose fibres since these both consist of cellulose and their properties differ in degree rather than in nature. Recently new methods have been developed for analysing cotton-viscose mixtures and on account of their general interest they are summarised as follows:—

McGregor and Fryd ("J. Text. Inst.," 1933, 24, 103T) have found that when viscose rayon is in intimate admixture with cotton it is not satisfactory to use the analytical method of Lloyd and Priestley ("J. Soc. Dyers and Col.," 1929, 45, 201) in which the viscose rayon only is removed from the mixture by treatment with 60° Tw. sulphuric acid at 50° C. under specified conditions. On the other hand, it is found that a suitable solution of calcium thiocyanate (Krais and Markert: "Rev. gen. mat. col.," 1931, 35, 281) can be prepared such that it dissolves viscose rayon from an intimate cotton-viscose rayon mixture without appreciably affecting the cotton, and McGregor and Fryd have established the conditions necessary to make this method quite accurate.

Preparation of the Solution

The thiocyanate solution is prepared by dissolving 80 grams of calcium thiocyanate in 100 c.c. of water and adjusting its boiling point to 122°-123° C. either by the addition of water (for depressing the b.p.) or by addition of calcium chloride (for increasing the b.p.); afterwards the solution is rendered slightly acid to litmus (*pH* = 2.1) by addition of glacial acetic acid.

One gram of the cotton-viscose rayon mixture conditioned at 60-65 per cent. relative humidity is treated for 30 minutes (with mechanical stirring) at 70°-80° C. in a 250 to 300 c.c. flask with 70 c.c. of the calcium thiocyanate solution. The contents of the flask are then filtered through a glass filter crucible (Becker pattern, 2G.1), the residue of cotton further treated with 30 c.c. of the calcium thiocyanate solution for 10 minutes and the product again filtered. The cotton residue is then purified by boiling twice with water for 30 minutes, dried, conditioned, and weighed. A number of results obtained with cotton-viscose rayon mixtures containing 25 to 75 per cent. of rayon indicate that the method is extremely accurate.

In investigations of possible methods for analysing cotton viscose rayon mixtures, B. P. Ridge and K. Turner ("J. Soc. Chem. Ind.," 1933, 52, 86T) turn to cuprammonium fluidity

and copper number measurements and find that both of these can be employed. Firstly, it is noted that the fluidities of $\frac{1}{2}$ per cent. cuprammonium solutions of raw cotton and viscose rayons are 1.2, and 36.40 respectively. Thus a simple linear relationship holds between the percentage of viscose rayon in a cotton-rayon mixture and the logarithm of its viscosity. The actual expression is $P = a (\log_{10} F - b)$, where P is the percentage of viscose rayon in the mixture, F the fluidity, and a and b are constants depending on the types of cotton and rayon. Thus, for a mixture of scoured Sakel cotton and A quality viscose the relationship was $P = 102.5 (\log_{10} F - 0.6)$, whilst for a mixture of raw Memphis cotton and Vistra rayon it was $P = 75.1 (\log_{10} F - 0.2)$. The following fluidities obtained with $\frac{1}{2}$ per cent. cuprammonium of various mixtures of cotton and viscose rayon illustrate how mixtures of these fibres may be determined with a fair degree of accuracy.

An alternative method of analysis makes use of the fact that after a standard hypo-bromite oxidation (Birtvell, Clibbens, Geake and Ridge, "J. Text. Inst.," 1930, 21, 85) the copper numbers of scoured cotton and viscose rayon are increased to 1.5 and 4.0 respectively; a slight amount of over-bleaching or attack by acids has little effect on these numbers. By oxidising the cotton-rayon mixture it is then possible to calculate its composition from the equation, $P = 40 C - 60$, where P is the percentage of viscose rayon and C the copper number of the mixture after oxidation. This method is particularly suitable for the analysis of mixtures containing bleached cotton, whilst the fluidity method is more suitable for those having raw cotton as one constituent. It also gives good results when the proportion of viscose rayon present is small.

Mercerised cotton is more susceptible to the hypobromite oxidation than is ordinary cotton, and under the standard conditions its copper number rises to 2.2. Hence the following equation must be used for mercerised cotton-rayon mixtures, $P = 35 C - 120$.

Danish Fertiliser Trade in 1933

THE Danish Co-operative Fertiliser Association, the most important factor in the Danish fertiliser trade, reported sales for 1933 of 185,000 metric tons, a gain of 8,000 tons over 1932. In surveying fertiliser consumption during the year 1933-34 the association states that sales of superphosphate should be about 20 per cent. above the 1932-33 figure. Gains are also anticipated in the sale of other materials, with the exception of ammonium sulphate. Under the import control regulations, Danish plants will be depended on to supply three-fourths of the requirements. Potash and nitrogen fertilisers were added to the import control list on December 11, 1933, and now an exchange permit is required to import all fertilisers into that country.

Britain's Recent Commercial Policy

Federation of British Industries' Survey

THE Federation of British Industries has submitted to the Government a survey of Britain's recent commercial policy, a memorandum which forms an attempt to give as impartial an account as possible of the present position of British trade as a result of the changes in commercial policy which have occurred since 1930. The four main lines upon which this policy has developed have been (1) The construction of a British tariff; (2) the conclusion of inter-imperial agreements at Ottawa; (3) the negotiation of reciprocal trading agreements with Denmark, Norway, Sweden, Iceland, Finland, Argentina, and (4) the rehabilitation of Britain's agriculture.

The memorandum points out that these different parts of our national policy have in a large measure been developed independently of one another, with the result that in certain directions they have tended to come into conflict. Our domestic agricultural policy, for example, has been elaborated without any very clear conception as to its relation to our future overseas commercial policy, and *vice versa*. This makes an appraisal of results a matter of more than ordinary difficulty, especially as the statistical information available is in any case of so general a nature that it is far from easy to apportion the factors responsible for the aggregate changes which have occurred in the quantity and direction of our trade during the past twelve to eighteen months. But there have been even more serious obstacles to arriving at a correct measure of the results attained. 1933 will go down to history as the year in which occurred the final breakdown of the international gold standard and the world price structure dependent upon it. The decisive step was the devaluation of the U.S. dollar. This set in train a new wave of international currency instability, the ultimate effects of which on world prices and production cannot as yet be estimated. 1933 also witnessed an intensification of the network of restrictions on the movements of foreign exchange and goods, leading, in the case of certain countries, to the deliberate adoption of "self-sufficiency" as the national goal.

International Finance

An especially embarrassing complication has been the circumstance that the breakdown in the machinery of international finance, coupled with competitive depreciation of currencies which it brought in its train, has tended to destroy the value of the ordinary published trade returns as a measure of the actual changes which have occurred. The export figures of the U.S.A. may be cited as an instance of this. The figures for the value of America's overseas trade during the year April 1, 1933 to March 31, 1934, as published, suggest that there was an expansion of something like 26 per cent. in her export trade during the year. If, however, these figures are corrected for the average depreciation of something like 33 per cent. as compared with the previous year 1932-3 in the value of the dollar on the foreign exchanges, that increase is converted into a decline of about 10 per cent. To get round this difficulty it is necessary to employ, where possible, figures for quantities rather than for value. But even this procedure is not entirely satisfactory, for during the period under review, changes occurred in prices which had nothing to do with alterations in the value of currencies. In many countries 1933 saw the beginning of a recovery from the great slump. This would of itself account for a good deal of the improvement to be noted in the case of the "sterling area" countries in the tables quoted in the memorandum.

Although it is possible to draw certain deductions from the survey it must be borne in mind that so many factors affect the present position, and the economic state of the world is so liable to rapid change that the deductions to be drawn for the future are neither as definite nor as clear as one would desire.

The memorandum sets out the following conclusions: The operation of the British tariff has greatly improved the position in the home market. In the event, however, of a substantial depreciation of foreign currencies as against the £, the effect of the tariff would be seriously impaired, and further steps would be required to give home production the reason-

able measure of protection which is necessary for its economic development.

The introduction of a tariff has not had the adverse effects upon the export trade predicted by the opponents of Protection. On the contrary, in a world of shrinking international trade and severe depression, British exports have ceased to fall, and have even slightly increased. Great Britain has regained the position of the chief exporting country of the world. This, however, cannot be considered a stabilised position owing to the possibility of currency manipulation or other measures by foreign countries.

The area of the world covered by the Ottawa and foreign trade agreements has been the most satisfactory for British export trade. It is, however, premature to decide how much of the credit for this improvement is to be attributed to the agreements themselves and how much to other factors. For instance, the fact that the area in question is largely complementary in production to Great Britain, and in general has linked its currency with sterling, must have had a considerable bearing upon the comparatively satisfactory results obtained. It is, however, to be noted that so far as the trade figures available to date are concerned, the various Ottawa agreements have proved more beneficial to the Dominions overseas than to Great Britain.

Co-ordination of Industry and Agriculture

If the policy of trade agreements with the Empire and with foreign countries is to be pursued with success, real co-ordination between the industrial policy and the agricultural policy of this country is vital. A balance will have to be struck between the extent to which this country is to be made self-sufficing in agricultural production, and the extent to which the export trades are to be stimulated by means of agreements designed to facilitate the export of British products in exchange for imported food and raw materials. Only when the economic limits of agricultural development in Great Britain have been envisaged will it be possible to pursue a co-ordinated policy to increase British exports, first of all to the Empire and secondly to foreign countries.

It will not be practicable to arrive at a satisfactory measure of the full benefits to be derived from Britain's new commercial policy until that policy has been completed. The outlines of the present British tariff system must be filled in, and the policy of concluding trade agreements with overseas countries extended to cover as wide a field as possible.

The future course of trade, both with the Empire and with the "trade agreement" countries, must be carefully watched in order to ensure that benefits are obtained by this country fully commensurate with the advantages offered by it as the greatest market for imports in the world.

Titanium Pigments Industry

New North East Coast Factory

EARLY next month, Sir Robert Horne will officially open the factory which has been built by British Titan Products, Ltd., for the manufacture of titanium pigments at Billingham-on-Tees. This step is of interest because, first, it means the beginning of another new enterprise in this depressed area; and secondly, because it marks a fresh advance in the home manufacture of products hitherto imported from abroad.

A booklet describing the history of the industry and outlining the growing uses for titanium pigments is being prepared and will shortly be available. Although the industry's history covers a period of less than half a century, its major advances having taken place within the past 15 years, uses for its products are developing with extreme rapidity. Titanium pigments are already being used by trades as widely varied as paint, paper, linoleum, artificial leather, plastics, glass, ceramics, cement rubber, printing inks, artists' colours, cosmetics and artificial silk.

New Technical Books

LABORATORY MANUAL OF COLLOID CHEMISTRY. By Harry N. Holmes. Third edition. pp. 229. Chapman and Hall, Ltd. 20s.

This book was originally written at the request of the Colloid Committee of the National Research Council of the United States. The first edition appeared in 1922, since when the field of colloid chemistry has broadened very greatly. Without definitely enlarging the book, much new material has been substituted for old and a great variety of working methods have been introduced. New material has been added in respect of catalysis, non-aqueous colloidal systems, froths and films, emulsions, surface and interfacial tension, and adsorption. When an unusual technique in the colloid realm is needed this manual will serve as a reliable reference guide.

INTRODUCTORY COLLOID CHEMISTRY. By Harry N. Holmes. pp. 198. Chapman and Hall, Ltd. 15s. 6d.

This book was written in response to a general demand for a short and clear, yet moderately comprehensive statement of the fundamentals of colloid chemistry, for it is pointed out that most learners advance more rapidly in a new subject if they begin with a brief general survey. The chapters relate to particle size; dialysis, diffusion and ultrafiltration; the preparation of colloids; coagulation or flocculation, surface tension; froths and films; emulsions; gels and jellies; soaps; the colloid chemistry of proteins; reactions in gels; viscosity and plasticity; non-aqueous colloidal systems; adsorption from liquids and gases; catalysis and colloid chemistry; and soils, clays and dusts. Those desiring to extend the range of their reading will find a great many helpful suggestions and the most important references to the available literature.

THE ATOM. By John Tutin, D.Sc. With an introduction by Professor Frederick Soddy, F.R.S. pp. 103. Longmans, Green and Co. 6s.

No one interested in modern science should fail to read this book. It deals with a problem of profound importance, and although written by a scientist for scientists, the simplicity of the argument is such that the general reader fond of science will find it intelligible. Dr. Tutin has discovered that when the interior of the atom was first explored by Rutherford about 20 years ago, an important possibility was overlooked, and that this leads to entirely new conceptions of the internal structure of the atom. The book is concerned with the interesting problem of contrasting the two possibilities from the point of view of their interpretation of important fundamental phenomena such as magnetism, radio-activity, and electrical conductivity, with the object of deciding "which atom is real and which is an inverted image of reality." It is evident that the discovery of an alternative atom may have far-reaching consequences in the scientific world. The book will be closely read by all those who are directly engaged on pure or applied science, but Dr. Tutin explains the new principles in language that will be intelligible to the general reader as well as to the scientist, and he draws special attention to the important philosophical consequences of the alternative atom, as contrasted with the views of Eddington and Jeans.

A FIVE YEAR BIBLIOGRAPHY OF THE THEORY OF REFRIGERATION, REFRIGERANTS AND APPLIANCES, 1929-1933. Compiled by H. T. Pledge, B.A. Published for the Science Museum by His Majesty's Stationery Office. Price, 2s. net (2s. 6d. net printed on one side only).

A complete list of all references to articles, papers and books on every branch of refrigeration would fill a book of such vast proportions that it would defeat its own object. For this reason and because of the rapid developments in recent years the Science Library of the Science Museum, when preparing a bibliography on the subject, decided to limit its scope to the five years, 1929 to 1933. Part I, which is devoted to the theory of refrigeration, refrigerants and appliances, has now been published and is recommended to those firms and individuals who wish to know the British, European and American sources of information on the subject. Part II, which will deal with the effect of refrigeration on the bac-

teriology and biochemistry of foods, etc., and on the applications of refrigeration (except where the papers describe appliances), is expected to be ready shortly. No such complete bibliography on refrigeration has hitherto been compiled; its appearance is of special interest in connection with the Refrigeration Exhibition at the Science Museum. The references are classified under the Classification Décimale Universelle and the book under review is divided under the following headings: Treatises on refrigeration; refrigeration in general; refrigerants; general works on refrigerating plants as a whole and individual refrigerating plants; refrigeration in various industries; principles of plant construction, insulation, etc.; general works on refrigerating units and parts of plant; theory of refrigerating machines; various methods of refrigerating; parts of machines, compressors, condensers, absorbers, etc.; domestic refrigerators, ice chests, etc.; ice manufacture; and refrigeration in air conditioning.

Taxation Handicap on Industry

Its Effect on Oil Products

LORD BEARSTED presided at the annual meeting of the "Shell" Transport and Trading Co., Ltd., in London, on June 19, and spoke of the serious handicap on industry of the present heavy burden of taxation. The burden of contributions levied upon the oil industry by various Governments had, he said, increased in weight, and the sums contributed by the group in which that company was interested amounted in the past year to approximately £51,800,000 in direct duties and income tax, while the shareholders in the group received in dividend only about £6,000,000, on a large proportion of which they either had to pay income tax or super tax or both.

Referring to the recently extended taxation on oils imported into this country, Lord Bearsted said the tax on heavy oil acted only to a limited degree as a protective tax. In some cases the extra cost of the oil had caused, and would no doubt in future cause, certain users to change over to some other fuel, but in the majority of cases the user would continue to use the oil, but at the higher price. The tax was, therefore, a definite handicap on industry and was paid for the most part by the most progressive and most efficient section of industry, by that section, in other words, which deserved the greatest encouragement rather than penalties. The duty was also a handicap on industry in another direction, but this time in a direction in which no question of competition with any home produced product arose. He referred to lubricating oil, of which there was consumed in this country in 1933 some 110 to 115 million gal. At 1d. per gal. the tax on this quantity amounted to £460,000, most of which came out of the pocket of industry. Even the very industries which were supposed to benefit from the tax had to pay so much in extra taxation that it was doubtful whether they, in fact, benefited at all. Take, for instance, the gas industry. The Chancellor of the Exchequer said the tax was imposed at the request of coal, gas, electricity and railways. As a result of the tax the gas industry might sell a few million more cu.ft. of gas, but it would have to pay in extra taxation 1d. per gal. on all the lubricating oil it bought and £240,000 a year on the gas oil that it had to buy to enrich its coal gas.

For several years past he had spoken of the handicaps imposed on world trade by the nationalist tendencies which imposed tariff barriers and exchange restrictions. He wished he could say that he saw some relaxation in sight, though he believed that thoughtful men in all countries were more and more of opinion that these did more harm than good. Unemployment was rife all over the world. Think what it would mean in terms of employment if the merchant fleets of the nations once more sailed the seas carrying goods in exchange from one country to another. This should not be a political question, nor a matter of sectional interest. In these days we all prayed for peace, which was far more likely to be attained by free intercourse and exchange between peoples than by a narrow-minded nationalism.

Institution of Petroleum Technologists

Next Week's Summer Meeting

THE summer meeting of the Institution will be held in London on Thursday and Friday, June 28 and 29, at the Royal Society of Arts, John Street, Adelphi.

On Thursday, June 28, there will be a formal opening of the meeting by the president, at 10.30 a.m.. A paper on "Oil and Coal from the Viewpoint of the Petroleum Industry," by C. Dalley, M.I.E.E., M.Inst.P.T., will be presented for open discussion. In the afternoon there will be further papers on "The Advantages Secured by Expressing Quantities of Liquid Petroleum Products in Terms of Volume of Capacity rather than by Weight," by J. McConnell Sanders, F.I.C., F.C.S., M.Inst.P.T., and "The Format of the Journal of the Institution of Petroleum Technologists," by George Sell, M.Inst.P.T., associate editor.

On Friday, June 29, reports on the progress of naphthology (refining and chemical section) will be presented at 10.30 a.m., Mr. F. H. Garner, Ph.D., M.Sc., F.I.C., chairman of the Abstracts sub-committee, presiding. These papers include "The Cracking Art in 1933," by Gustav Egloff, Ph.D., M.Am.Inst.Chem.E., M.Am.Chem. Soc., and Badona L. Levinson; "Chemical and Physical Refining," by C. G. Verver and R. N. J. Saal; "Natural Gas and Natural Gasoline," by Thelma Hoffmann; "Crude Oil," by W. H. Thomas, A.R.S.M.; "Motor Spirits and Light Distillates," by E. B. Evans, M.Sc., A.I.C.; "Gasoline Engines and Knock Test-

ing," by C. H. Barton, A.I.C.; "Kerosine and White Spirit," by J. S. Jackson, B.Sc., A.I.C., M.Inst.P.T.; "Lubricants and Lubrication," by A. R. Bowen, D.Sc., Ph.D., F.I.C., A.M.I.Chem.E.; "Gas Oil, Diesel Oil and Fuel Oil," by C. G. Verver; "Oil Engine Developments and the Testing of Diesel Fuels," by R. Stansfield, A.M.Inst.C.E., M.Inst.P.T.; "Asphalts and Road Materials," by J. Greutert and R. J. Forbes; "Special Products," by S. F. Birch, Ph.D., B.Sc., A.I.C.; "Analysis and Testing," by C. Chilvers, B.Sc., F.I.C.; "Chemistry of Petroleum," by G. R. Nixon, A.R.C.Sc., B.Sc.; "Motor Benzol," by W. H. Hoffert, B.Sc., F.I.C.; "Low Temperature Carbonisation," by F. S. Sinnatt, D.Sc.

Reports on the progress of naphthology (field technology, geology, and general sections) will be presented on Friday afternoon, at 2.30 p.m., Mr. A. Beeby Thompson, M.I.Mech.E., M.Inst.M.M., F.G.S., presiding.

The sixteenth annual dinner of the Institution will be held on Friday, June 29, at 7 p.m. for 7.30 p.m., at the Park Lane Hotel, Piccadilly. The Redwood Medal, which has been awarded by the Council to Dr. David White, of the United States Geological Survey, will be presented during the course of the dinner. The tickets for the dinner will be 12s. 6d. (student members, 7s. 6d.) each, exclusive of wines, but including gratuities.

Volumetric Glassware

Standardised Tests at the N.P.L.

A NEW edition of "Tests on Volumetric Glassware" has just been issued by the National Physical Laboratory. No fundamental changes have been made from the preceding edition but several points have been dealt with in more detail; for example, the testing of burette taps and permissible schemes of subdivision of scales on graduated glassware. Copies of the new edition may be obtained free of charge, on application to the Director, National Physical Laboratory, Teddington, Middlesex.

Ordinary pipettes are clamped vertically for test and filled with water to a short distance above the mark. Water is run out until the meniscus is on the mark and the outflow is then stopped. The drop of water then adhering to the jet is removed by bringing the surface of some water contained in a beaker into contact with the jet and then removing it without jerking. The pipette is then allowed to deliver into a clean weighted vessel held slightly inclined so that the tip of the jet of the pipette is in contact with the side of the vessel. The pipette is allowed to drain for $\frac{1}{4}$ minute after outflow has ceased, the jet being in contact with the side of the vessel. At the end of the draining time the receiving vessel is removed from contact with the jet of the pipette, thus removing any drop adhering to the outside of the pipette. To determine the instant at which the outflow ceases, the motion of the water surface down the delivery tube of the pipette is observed, and the delivery time is considered to be complete when the meniscus comes to rest slightly above the end of the delivery tube. The $\frac{1}{4}$ minute draining time is counted from this moment.

When testing burette stopcocks for leakage, the key and barrel of the stopcock are first cleaned quite free from grease. The key is then dipped into water and replaced in the barrel so that the whole area of contact between the key and the barrel is wet. The burette is then filled with water to a point a few millimetres above the 0 ml. mark. Water is then run out through the delivery jet at such a rate that the motion of the water surface down the burette tube is sufficiently slow to be under control and the stopcock is shut off when the lowest point of the water meniscus is exactly on

the 0 ml. mark. The time at which this setting is made is noted. The position of the water surface is again read on the burette scale about half an hour later, the time at which this reading is taken being also noted. This reading divided by the time which elapses between making the setting on the zero mark and taking the final reading gives the rate of leakage. This procedure is repeated with the stopcock key turned through 180° relative to its position in the first test.

If the rate of leakage in each of the above tests is not in excess of the appropriate tolerance from the table given below, the stopcock is passed.

Length occupied by 1 ml on the scale of the burette.		Maximum Permissible Rate of Leakage.
Less than 2 mm	0.010 ml per min.	
2 mm or more but less than 5 mm	0.008 " " "	
5 mm " " " " 10 mm	0.006 " " "	
10 mm " " " " 20 mm	0.004 " " "	
20 mm " " " " 50 mm	0.003 " " "	
50 mm " " " " 100 mm	0.002 " " "	
100 mm or greater	0.001 " " "	

Burettes are clamped vertically for test and filled with water to a short distance above the zero mark. Water is then slowly run out until the meniscus is exactly on the zero mark. The drop of water then adhering to the jet is removed by bringing the inside of a glass beaker into contact with the jet. The burette is then allowed to deliver freely, *i.e.*, with the stopcock fully open, into a clean weighted vessel. It is necessary, however, to arrest the flood of liquid in time to obtain control over the final movement of the water surface and to bring the meniscus to rest accurately on the line to be tested. The burette is therefore allowed to deliver freely until the water surface is approximately 1 cm. from the line to be tested. The rate of outflow is then reduced and the motion of the water surface brought under control so that an accurate setting can be made on the line in question. No period of waiting for drainage is allowed. The drop adhering to the jet after the setting has been made is removed by bringing the side of the receiving vessel into contact with the jet.

British Overseas Chemical Trade in May

Substantial Increase in Exports

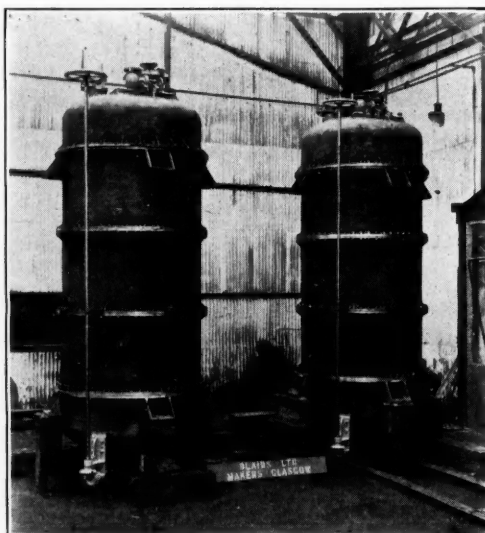
THE Board of Trade returns for the month ended May 31, from which the following figures are extracted, show that exports of chemicals, drugs, dyes and colours during the month totalled £1,809,615, representing an increase of £221,321 over May, 1933. Imports were valued at £973,906, an increase of 122,617, and re-exports totalled £45,489, against £38,232, an increase of £7,257.

	Quantities.		Value.			Quantities.		Value.	
	May 1933.	1934.	May 1933.	1934.		May 1933.	1934.	May 1933.	1934.
			£	£				£	£
Imports									
Acids—					Medicinal oils .. cwt.	2,253	2,774	5,904	6,010
Acetic cwt.	16,359	16,551	27,393	27,564	Ointments and liniments .. cwt.	10	7	333	336
Boric (boracic)	2,289	3,207	2,358	3,197	Proprietary medicines ..	—	—	36,545	44,519
Citric	1,030	1,290	3,216	3,705	Other manufactured ..	—	—	42,485	52,512
Tartaric	2,777	4,982	9,892	20,759	sorts	—	—	41,033	34,767
All other sorts	—	—	8,406	8,488	Raw or simply prepared ..	—	—	—	—
Calcium carbide .. cwt.	68,195	70,335	38,274	41,045	Finished dyestuffs (coal tar) .. cwt.	4,363	4,732	101,571	128,920
Potassium compounds—					Extracts for tanning—				
Caustic and lyes .. cwt.	10,679	10,818	11,522	13,613	Chestnut .. cwt.	42,237	30,061	29,460	20,329
Chloride (muriate) ..	19,498	22,863	10,327	10,302	Quebracho	33,119	44,066	19,416	26,407
Kainite and other mineral potassium fertiliser salts, not elsewhere specified .. cwt.	27,861	33,879	4,544	6,202	All other sorts	24,322	49,127	18,814	36,268
Nitrate (saltpetre) ..	12,899	8,817	10,701	8,760	All other dyes and dyestuffs, etc. .. cwt.	7,383	7,841	17,329	19,236
Sulphate	4,600	5,410	2,550	2,756	Painters' colours and materials—				
All other compounds ..	8,480	9,284	13,573	16,098	White lead, basic carbonate cwt.	7,728	7,304	9,367	8,479
Sodium compounds—					Lithopone	20,168	29,358	14,282	19,246
Carbonate, including crystals, soda ash and bi-carbonate .. cwt.	3,081	11,728	1,216	3,715	Ochres and earth colours .. cwt.	20,092	28,977	7,979	10,124
Chromate and bichromate cwt.	2,757	3,890	3,975	5,642	Bronze powders	4,543	1,614	18,313	11,453
Cyanide	—	2,220	—	5,240	Carbon blacks	28,913	34,956	32,505	51,959
Nitrate	1,702	32,947	563	6,725	Other pigments and extenders, dry .. cwt.	27,421	24,696	7,769	8,937
All other compounds ..	16,344	14,330	12,823	15,555	All other descriptions ..	10,165	18,399	23,677	39,991
Other chemical manufactures	—	—	253,625	248,951					
Drugs, medicines, etc.—					Total	—	—	851,289	973,906
Quinine and quinine salts .. oz.	132,462	61,363	9,549	5,496					
Exports									
Acids—					Drugs, medicines and medicinal preparations—				
Citric cwt.	3,376	4,076	11,333	13,643	Quinine and quinine salts .. oz.	115,145	101,150	11,383	11,281
All other sorts	—	—	17,409	23,977	Proprietary medicines ..	—	—	88,736	105,058
Aluminium compounds .. tons	5,607	6,114	52,988	64,965	All other descriptions ..	—	—	119,004	140,792
Ammonium sulphate ..	25,904	33,045	151,478	194,021	Dyes, dyestuffs and extracts for dyeing and tanning—				
Other ammonium compounds tons	541	1,068	10,602	15,135	Alizarine and indigo (synthetic) .. cwt.	667	3,290	4,345	18,769
Bleaching powder (chloride of lime) .. cwt.	55,781	40,017	15,568	10,484	Other finished dyestuffs (coal tar) .. cwt.	6,035	5,790	71,356	70,152
Tar oil, creosote oil, etc. gal.	2,787,666	1,110,227	32,851	18,485	All other descriptions ..	16,858	22,011	19,913	28,151
Other coal tar products ..	—	—	41,079	28,913	Painters' colours and materials—				
Copper, sulphate of .. tons	2,700	5,188	38,078	72,127	Ochres and earth colours .. cwt.	22,679	16,722	18,314	15,530
Disinfectants, insecticides .. cwt.	25,895	34,518	55,164	75,601	Other pigments and extenders, dry .. cwt.	16,489	29,676	17,334	29,305
Glycerine	8,923	16,444	16,140	34,508	White lead	6,495	5,759	12,308	10,849
Lead compounds	14,636	15,929	21,086	19,158	Paints and painters' enamels, prepared .. cwt.	26,659	44,146	79,593	112,023
Magnesium compounds .. tons	475	464	10,696	11,622	Varnish and lacquer .. gal.	60,241	83,719	23,819	33,492
Potassium compounds cwt.	4,450	4,179	12,786	11,695	All other descriptions ..	38,163	26,527	76,929	55,856
Salt (sodium chloride) tons	22,957	21,968	61,519	53,315	Colours and materials, not elsewhere specified cwt.	115,505	129,806	228,297	257,055
Sodium carbonate, including crystals, ash and bi-carbonate .. cwt.	313,595	382,035	82,966	96,476					
Caustic soda	189,927	158,981	118,847	103,572	Total	—	—	1,588,294	1,809,615
Other sodium compounds .. cat.	160,810	129,205	88,912	105,108					
Zinc oxide tons	1,211	951	23,640	18,770					
All other descriptions ..	—	—	181,518	206,692					
Re-Exports									
Chemical manufactures and products	—	—	16,185	15,804	Dyes, dyestuffs and extracts for dyeing and tanning .. cwt.	1,091	313	1,441	752
Drugs, medicines and medicinal preparations—					Painters' colours and materials cwt.	243	290	728	488
Manufactured or prepared	—	—	10,142	21,187					
Raw or simply prepared ..	—	—	9,736	7,258	Total	—	—	38,232	45,489

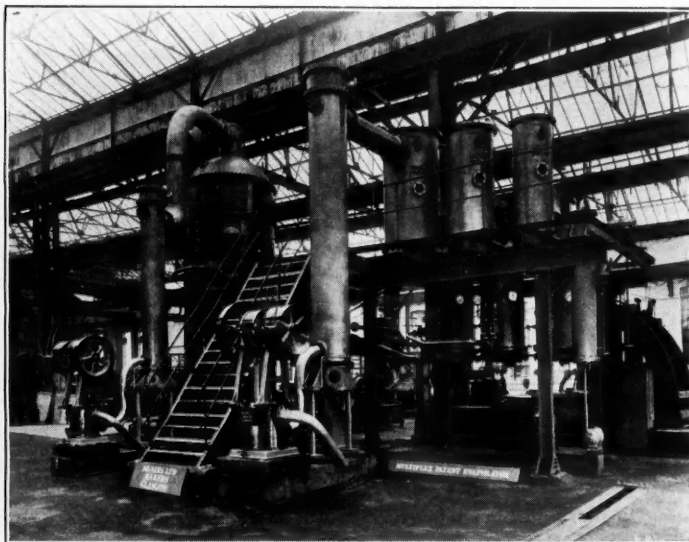
Modern Industrial Chemical Plant

Some Typical Installations

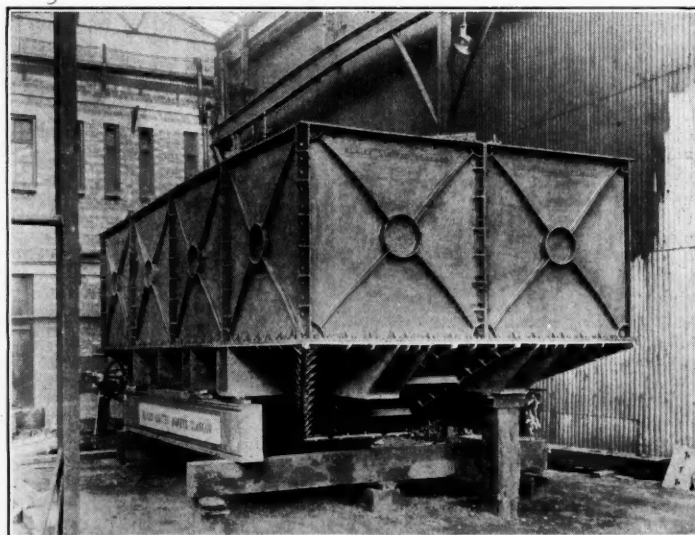
THESE illustrations of recently installed industrial chemical plant are reproduced by the courtesy of Blairs, Ltd., Glasgow. They serve to indicate the great advances made in plant design and construction in the past few years, and the ability of the British chemical plant manufacturer to compete effectively with the foreign manufacturer in meeting the most exacting requirements of the chemical producing industry.



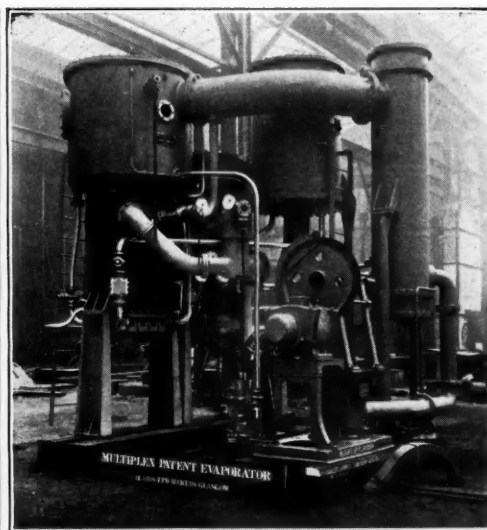
Two Bronze Autoclaves made in flanged sections, and suitable for a working pressure of 100 lb. per sq. in. The Autoclaves are fitted with bronze steam inlet pipe and bronze coil inside, steam valves, inlet and outlet valves, etc., and all arranged for operating from the top working platform.



One Improved Patent "Multiplex" Triple Effect Film Evaporator of the Side Separator type, and one Blairs' Patent Vacuum Finishing Pan. These have all parts coming in contact with the vapour or liquor made of copper or gunmetal. The Evaporator and Pan are complete with pre-heater, surface condensers, vacuum pumps and liquor withdrawal pump.



Cast Iron Tank, 20 ft. long by 10 ft. wide by 5 ft. deep, constructed with bottom 4 ft. deep, tapered to outlet 10 in. by 9 in., and provided with supporting feet cast on, all made in plates suitably ribbed and having flanges machined full across, complete with the necessary tee bar stiffeners and stay rods.



A "Multiplex" Patent Double Effect Film Evaporator of the Side Separator type, arranged for working under vacuum. The Evaporator is complete with surface condenser, belt-driven extraction pump and electrically driven vacuum pump, and all the necessary pipe connections, index tube, etc.

Lawn Tennis Tournament

Date and Venue for The Chemical Age Finals

THE second round matches in the fourth annual CHEMICAL AGE Lawn Tennis Tournament are now in progress, and competitors are reminded that the results of all matches must reach us not later than first post on July 3. All the results, together with details of the third round draw, will be published in THE CHEMICAL AGE of July 7.

In the meantime we have pleasure in announcing that we have accepted a cordial invitation from the Anglo-Persian Oil Co., Ltd., to arrange for the finals to be played at the Britannic House Club, Lower Sydenham, on Saturday, September 15. The venue is conveniently situated and it is hoped that those who have attended the finals in previous years will book the date at once; further details and invitations will be issued later.

Thomas Hill-Jones, Ltd., of Invicta Works, Bow Common Lane, E.3, have kindly promised to present "Invicta" silver statuettes to be awarded outright to the winners of the doubles and the singles, and Mr. W. Lloyd-Willey, director of the same company, is presenting silver statuettes of similar pattern, to be known as the "Lloyd-Willey" statuettes, for each of the three runners-up. The winners will hold, jointly with the firms they represent, THE CHEMICAL AGE silver challenge cups for twelve months.

Redemption of Debentures

Imperial Chemical Industries Repayments

THE directors of Imperial Chemical Industries, Ltd., announce that in accordance with the provisions attaching to each issue, it has been decided to redeem out of the company's liquid resources, at a total cost of £3,645,854, the following debentures of subsidiary companies, and the necessary notices will be posted to the debenture holders as soon as possible: Castner Kellner Alkali Co., Ltd., 4½ per cent. first mortgage debenture stock; Chance and Hunt, Ltd., 4 per cent. first mortgage debentures; Chance and Hunt, Ltd., 4½ per cent. second mortgage debentures; Elliott's Metal Co., Ltd., 4 per cent. debenture stock; I.C.I. Metals, Ltd., 4 per cent. debentures, and I.C.I. (General Chemicals), Ltd., 5 per cent. mortgage debenture stock.

Since November, 1933, the following debentures have already been redeemed at a cost to the company of £579,068: Curtis's and Harvey, Ltd., 4½ per cent. first mortgage debenture stock; I.C.I. (Lime), Ltd., 5 per cent. debentures, and Welsbach Light Co., Ltd., 4½ per cent. debenture stock.

A Wise Move

The withdrawal from liquid resources of the large sum required to affect repayment of these stocks will not place the least strain on the company, for the holdings of Government securities, less reserve and cash, amounted at the end of 1932 to the large total of £8,264,002. That figure is almost £4,000,000 in excess of the total held two years earlier, the expansion being a reflection of industrial conditions. Gilt-edged investments alone amounted to £5,675,525, and since the average return must be considerably less than 4 per cent. realisation of a substantial proportion of those holdings for the purpose of providing for the repayment of stocks carrying interest at rates from 4 per cent. upwards is obviously a wise move.

As a result of the operation nearly all the debenture debts of the group will disappear, leaving only two—one on the head office building and the other the £1,371,200 of Fertiliser and Synthetic Products, Ltd. five per cent. debenture guaranteed under the T.F.A., which is optionally redeemable after the end of the year. Owing to the great shrinkage in international trade and consequent cheap money the scope for the employment of capital is greatly reduced, and therefore a number of companies find themselves with redundant funds. In these circumstances their repayment is right and proper, however inconvenient it may be to holders. Incidentally, the repayment of capital affords further proof that it is not lack of capital or credit which prevents general trade recovery, but other and more fundamental causes.

No Business with Foreigners

J. C. and J. Field's Profits Maintained

THE ordinary general meeting of J. C. and J. Field, Ltd., was held in London on June 18. In moving the adoption of the report and accounts, Mr. J. D. Campbell, chairman of directors, said the profits of the company had been fully maintained and even showed a small increase, which enabled the board to recommend the payment of the usual 10 per cent. dividend on the ordinary shares and a bonus of 2½ per cent. for the past year, which, in view of the severe competition which the company had to meet, the board considered very gratifying. It was due to the increased sales of proprietary articles. Candle sales were still improving and the same applied to shaving cream. The public were appreciating this modern method of shaving, which required no shaving brush or soap. Toilet lavender preparations still continued their upward progress and were now obtainable all over the country, in spite of many inferior imitations on the market.

Complications Avoided

There was one feature connected with Field's which he wished to emphasise, and that was that practically the whole of the business was confined to England, Scotland and Wales, with some export to various parts of the British Empire. The management had cause for congratulation on having carefully avoided extending their business to foreign countries in spite of various tempting suggestions that had been put forward from time to time. They had thus avoided losses and complications which would otherwise have inevitably occurred. The shareholders could congratulate themselves that they were associated with a company doing an eminently British trade.

In the present year they were still experiencing intense competition everywhere, but, by exercising every economy, giving attention to detail, maintaining the quality and giving the best possible value for money, they had every reason to anticipate the continuance of their present happy position.

Marking of Foreign Goods

Federation of British Industries' Resolution

AFTER consultation with the chief trade associations throughout the country, the executive committee of the Federation of British Industries decided on June 13 to inform the Government that in its opinion the compulsory marking of all foreign goods is undesirable in the interests of British manufacturers. The Federation contends that so far as marking orders contribute towards the protection of British industry, that object can best be achieved by means of the tariff, and by the adoption of the further measures which the Federation has recommended should be taken if necessary, *i.e.*, quotas, exchange regulation, and the imposition of "special duties." Some of the chief exporting trades of the country fear that if a general marking order is imposed in Great Britain, it will lead to retaliation by foreign countries which, at present, do not impose marking regulations, with detrimental results to the British export trade.

Language Barriers

The British marking orders require that foreign goods subject to them should be marked in the English language, and if foreign countries adopted marking orders generally, and required that British goods should be marked in the language of those countries, grave complications would arise for the exporting trades. The Federation points out that no general marking order would suit the different requirements of the various trades. Inquiries would still have to be held as to the exact form the marking should take, and with regard to the exceptions, and this might well entail even greater expenditure of time and trouble for the various industries than is the case at present. There is a considerable difference of opinion between industries and even within individual industries as to the value of compulsory marking. Any attempt on the part of the Government to impose marking orders upon industries would be widely resented.

Continental Chemical Notes

AN ITALIAN SALES BUREAU representing the producers of liquid carbon dioxide has been set up in Milan for a period terminating on December 31, 1936.

* * *

A NEW COLOUR REACTION for potassium which can serve for estimation of the metal in presence of lithium, sodium, magnesium, calcium, strontium, and barium is based upon the formation of the difficultly soluble, orange-red potassium salt of hexanitrodiphenylamine (p-dipicrylamine).—*Chem.-Zeitung*, June 13.)

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SUPER-IODISED SEA WATER containing more than 500 milligrams iodine in salt form per litre is stated to be obtained by a recently patented French process (French Patent 763,083). Iodine-saturated air is continuously pumped into a sea water reservoir stocked with certain marine animals and plants, through the medium of which the iodine eventually makes its way into solution in salt form.

IN ITS REPORT for 1933, the Kali-Chemie A.G. announces a considerable increase in net profits over the previous year, the respective figures being 1,873,175 and 90,000 marks. The company is consequently in a position to resume dividend payments.

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GOOD TRADING CONDITIONS are being experienced by the Czecho-Slovakian carborundum industry. According to "Chemische Industrie" new markets have been acquired during the past year, reports the Vereinigte Carborundum-Werke A.G., resulting in increased production.

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RUBBER HYDROGENATION CATALYSTS in the form of oxides or sulphides of tungsten, molybdenum and other metals of the same group are held to be more resistant to poisons than the usual metallic catalysts such as nickel and platinum (German Patent 598,060). Hydrogenation of crepe rubber can be effected in the presence of the new catalysts at 150 atmospheres pressure and temperatures above 200° C.

News from the Allied Industries

Artificial Silk

IN THEIR REPORT for 1933, the directors of British Bemberg, rayon manufacturers, state that it is proposed to bring forward a debenture and share capital reorganisation plan before the end of the year.

Iron and Steel

THERE WERE 101 FURNACES in blast at the end of May, a net increase of three since the beginning of the month, four furnaces having gone into blast and one furnace having ceased operations. Production of pig-iron in May amounted to 527,900 tons, compared with 496,300 tons in April and 339,900 tons in May, 1933, the daily rate showing an increase of 3 per cent. compared with the previous month. The production includes 133,300 tons of hematite, 264,400 tons of basic, 104,700 tons of foundry, and 9,000 tons of forge pig-iron. The output of steel ingots and castings amounted to 780,000 tons, compared with 716,800 tons in April and 599,600 tons in May, 1933.

Building Materials

THE ADVICE OF THE BUILDING RESEARCH STATION has been frequently sought in troubles experienced in applying oil paints and washable distempers on plasters, Portland cement, asbestos cement sheets and other building materials, and a short bulletin on the subject has just been issued by the Department of Scientific and Industrial Research (Building Research Bulletin No. 11, "The Effect of Building Materials on Paint Films," H.M. Stationery Office, price 3d.).

AS PIONEERS in the manufacture of a new product for the building trade, British Plaster Board, Ltd., has already reaped a substantial reward. During the year which ended on April 30 the company increased its issued capital from £100,000 to £208,000, and, while the full effect of the additional outlay has yet to be felt, profits last year were nearly double those of 1932-33, the net trading revenue being £100,387 in comparison with £54,342. The directors have placed £38,142 to reserve and obsolescence funds (against £10,000) and are again paying 30 per cent. to the shareholders, the final distribution of 15 per cent. being made on the increased capital. The balance sheet shows the company to be well equipped to finance the balance of its capital programme. Against current liabilities of £69,000 it possesses floating assets amounting to £207,000, of which £136,000 consists of British Government securities and cash. Recently the management has been engaged upon the installation of plant and machinery at new works at Erith, Kent, and it is stated that the board plant is expected to be in production almost immediately.

Bleaching

THE RESULTS of the Bleachers' Association for the twelve months to March 31 indicate a rather disappointing experience. Whereas for 1932-33 preference shareholders received their full dividend, only a quarter's dividend—namely, to June 30, 1933—is now declared. The trading profit for the year ended March 31, 1934, was £246,023, including income from the sale of investments, against £385,772 (including transfer of £25,000 from tax reserve) in the previous year and £391,233 in the year ended March, 1932. The net profit was £2,424, against £107,173 and £112,634 respectively, and the amount available was £185,784, against £320,172 and £349,812. Presumably the company again found conditions in foreign markets very difficult. At the last general meeting the chairman emphasised this obstacle to profitable working and the severe competition from both home and foreign producers.

Tanning

EXTENSIONS TO PRESENT WORKS are still being reported in the light leather trade, and the chrome tanning industry. The duty on patent leather imported into this country has been raised from 10 per cent. to 15 per cent., chiefly with a view to assisting Canadian interests. It is doubtful whether this increase will be of much assistance to the home leather trade since only a negligible quantity of patent leather is being manufactured here. There is scope for the development of such a trade. Frecknall, Barnard and Scott, of Northampton, have recently acquired additional premises for the manufacture of semi-chrome gloving leather. They are also extending their old premises so as to provide ample space for a number of spray plants which are used in the finishing operations. Kip leather dressers are increasing their productions in view of the winter trade. The exports of sole leather for the first three months of this year showed a marked increase on those for the average last year so that there is good promise of last year's total being surpassed. The sole leather home trade is rather quiet owing to the continued demand for the cheaper qualities only, and the fear of slightly lower prices. The demand for glazed kid still continues, and most of the manufacturers are finding difficulty in meeting their requirements. Sandal leathers have proved extremely popular, but the demand for the present season having been met, manufacturers of this class of leather are working more normal. Glove leather manufacturers are extremely busy for the winter trade. Increasing amounts of chrome tanning salts are being used in this and other branches of the light leather industry. Suede leathers have proved an extremely popular line, and the demand for dyestuffs is as keen as ever.

Weekly Prices of British Chemical Products

Review of Current Market Conditions

ENCOURAGING statistics relating to overseas trade in chemicals, drugs, dyes and colours are included in the Board of Trade returns for May. Exports totalling £1,809,615, showed an increase of £221,321 over May, 1933, while imports, at £973,906, represented an increase of £122,617. Business has been on a moderate scale during the week, with very few price changes. Acetone, ammonium chloride, formic acid, oxalic acid and salamoniac have been in demand and there has been improved business in acetic acid and citric acid. There is keen competition for trade in formaldehyde and zinc oxide. In the coal tar market, creosote oil continues strong. There is a fair inquiry for cresylic acid, but carbolic acid is reported as less active. The tone of the pharmaceutical market is fairly steady, and prices have been maintained. There has been a moderate demand for lactic acid and sodium benzoate, but keen competition has been shown for chloral hydrate. Salol and phenazone continue dull items. The essential oils market has been fairly satisfactory, and several price changes have occurred, including increases in the price of white camphor and Japanese and Wayne county peppermint oils.

LONDON.—A fair volume of business is being received, with

markets mainly steady. There are no alterations in prices to report. The coal tar products market remains steady, prices being unchanged from last week.

MANCHESTER.—A moderate volume of buying interest among home trade users has been reported on the Manchester chemical market during the past week, and whilst the bulk of it has been in respect of prompt or near delivery positions there has again been a sprinkling of contract orders extending over the second half of the year. On the whole, the movement of supplies into consumption has been pretty well maintained but in few directions is there any indication of deliveries expanding beyond their recent level. Business this week has included a quiet demand for shipment. There has been little giving way so far as prices are concerned, and the outlook in this respect is generally regarded as steady, with small hope, from the buyer's point of view, of values moving in their favour. Among the by-products the tendency in the case of the light materials is still weak rather than strong although quotations are not actually easier on balance.

SCOTLAND.—There is little or no change in the movements in the Scottish heavy chemical market.

Price Changes

General.—CARBOLIC ACID, crystals, 8½d. to 8¾d. per lb.; PYRIDINE, 90/140, 6s. 6d. to 8s. per gal.; TOLUOL, 90%, 2s. 2d. per gal.; pure, 2s. 5d.

Essential Oils.—ALMOND, foreign S.P.A., 9s. 3d. per lb.; ANISE, 2s. 3d.; BERGAMOT, 6s. 6d.; BOURBON GERANIUM, 24s.; CAMPHOR, white, £5; CANANGA, Java, 9s. 6d.; CITRONELLA, Java, 1s. 10d.; Ceylon, 1s. 7d.; LEMON GRASS, 4s.; PALMA ROSA, 6s. 6d.; PEPPERMINT, Japanese, 3s. 9d.; Wayne county, 14s. 3d.

Manchester.—TARTARIC ACID, 1s. 0½d. to 1s. 0¾d. per lb.; LEAD ACETATE, brown, £31 10s. per ton; SULPHATE OF COPPER, £4 17s. 6d. per ton f.o.b.

All other prices remain unchanged.

General Chemicals

ACETONE.—LONDON: £65 to £68 per ton; SCOTLAND: £66 to £68 ex wharf, according to quantity.

ACID, ACETIC.—Tech. 80%, £38 5s. to £40 5s.; pure 80%, £39 5s.; tech., 40%, £20 5s. to £21 15s.; tech., 60%, £28 10s. to £30 10s. LONDON: Tech., 80%, £38 5s. to £40 5s.; pure 80%, £39 5s. to £41 5s.; tech., 40%, £20 5s. to £22 5s.; tech., 60%, £29 5s. to £31 5s. SCOTLAND: Glacial 98/100%, £48 to £52; pure 80%, £39 5s.; tech. 80%, £38 5s. d/d buyers' premises Great Britain. MANCHESTER: 80%, commercial, £39; tech. glacial, £52.

ACID, BORIC.—Commercial granulated, £25 10s. per ton; crystal, £26 10s.; powdered, £27 10s.; extra finely powdered, £29 10s. packed in 1-cwt bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots.

ACID, CHROMIC.—10½d. per lb., less 2½%, d/d U.K.

ACID, CITRIC.—9½d. per lb. less 5%.

ACID, CRESYLIC.—97/99%, 1s. 8d. to 1s. 9d. per gal.; 98/100%, 2s. to 2s. 2d.

ACID, FORMIC.—LONDON: £43 10s. per ton.

ACID, HYDROCHLORIC.—Spot, 4s. to 6s. carboy d/d according to purity, strength and locality. SCOTLAND: Arsenical quality, 4s.; dearsenicated, 5s. ex works, full wagon loads.

ACID, LACTIC.—LANCASHIRE: Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £48; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £53; edible, 50% by vol., £41. One-ton lots ex works, barrels free.

ACID, NITRIC.—80° Tw. spot, £18 to £25 per ton makers' works, according to district and quality. SCOTLAND: 80°, £23 ex station full truck loads.

ACID, OXALIC.—LONDON: £47 17s. 6d. to £57 10s. per ton, according to packages and position. SCOTLAND: 98/100%, £48 to £50 ex store. MANCHESTER: £49 to £53 ex store.

ACID, SULPHURIC.—SCOTLAND: 144° quality, £3 12s. 6d.; 168°, £7; dearsenicated, 20s. per ton extra.

ACID, TARTARIC.—LONDON: 1s. per lb. SCOTLAND: B.P. crystals, 11d., carriage paid. MANCHESTER: 1s. 0½d. to 1s. 0¾d.

ALUM.—SCOTLAND: Lump potash, £8 10s. per ton ex store.

ALUMINA SULPHATE.—LONDON: £7 10s. to £8 per ton. SCOTLAND: £7 to £8 ex store.

AMMONIA, ANHYDROUS.—Spot, 10d. per lb. d/d in cylinders. SCOTLAND: 10d. to 1s. containers extra and returnable.

AMMONIA, LIQUID.—SCOTLAND: 80°, 2½d. to 3d. per lb., d/d.

AMMONIUM BICHROMATE.—8d. per lb. d/d U.K.

AMMONIUM CARBONATE.—SCOTLAND: Lump, £30 per ton; powdered, £33, in 5-cwt. casks d/d buyers' premises U.K.

AMMONIUM CHLORIDE.—£37 to £45 per ton, carriage paid. LONDON: Fine white crystals, £18 to £19. (See also Salamoniac.)

AMMONIUM CHLORIDE (MURIATE).—SCOTLAND: British dog tooth crystals, £32 to £35 per ton carriage paid according to quantity. (See also Salamoniac.)

ANTIMONY OXIDE.—SCOTLAND: Spot, £26 per ton, c.i.f. U.K. ports. ANTIMONY SULPHIDE.—Golden 6½d. to 1s. 1½d. per lb.; crimson, 1s. 3d. to 1s. 5d. per lb., according to quality.

ARSENIC.—LONDON: £16 10s. c.i.f. main U.K. ports for imported material; Cornish nominal, £22 10s. f.o.r. mines. SCOTLAND: White powdered, £23 ex wharf. MANCHESTER: White powdered Cornish, £21 ex store.

ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.

BARIUM CHLORIDE.—£11 per ton.

BARYTES.—£7 to £8 10s. per ton.

BISULPHITE OF LIME.—£6 10s. per ton f.o.r. London.

BLEACHING POWDER.—Spot 35/37%, £7 19s. per ton d/d station in casks, special terms for contract. SCOTLAND: £8 in 5/6 cwt. casks for contracts over 1934/1935.

BORAX, COMMERCIAL.—Granulated, £14 10s. per ton; crystal, £15 10s.; powdered, £16; finely powdered, £17; packed in 1-cwt. bags, carriage paid home to buyer's premises within the United Kingdom in 1-ton lots.

CADMIUM SULPHIDE.—2s. 7d. to 2s. 11d.

CALCIUM CHLORIDE.—Solid 70/75% spot, £5 5s. per ton d/d station in drums.

CARBON BISULPHIDE.—£30 to £32 per ton, drums extra.

CARBON BLACK.—3½d. to 5d. per lb. LONDON: 4½d. to 5d.

CARBON TETRACHLORIDE.—£41 to £46 per ton, drums extra.

CHROMIUM OXIDE.—10½d. per lb., according to quantity d/d U.K.; green, 1s. 2d. per lb.

CHROMETAN.—Crystals, 3½d. per lb.; liquor, £19 10s. per ton d/d.

COPPERAS (GREEN).—SCOTLAND: £3 15s. per ton, f.o.r. or ex works.

CREAM OF TARTAR.—LONDON: £4 2s. 6d. per cwt.

DINITROTOLUENE.—66/68° C., 9d. per lb.

DIPHENYLGUANIDINE.—2s. 2d. per lb.

FORMALDEHYDE.—LONDON: £27 per ton. SCOTLAND: 40%, £28 ex store.

LAMPBLACK.—£45 to £48 per ton.

LEAD ACETATE.—LONDON: White, £34 10s. per ton; brown, £1 per ton less. SCOTLAND: White crystals, £33 to £35; brown, £1 per ton less. MANCHESTER: White, £34; brown, £31 10s.

LEAD NITRATE.—£28 per ton.

LEAD, RED.—SCOTLAND: £25 10s. to £28 per ton d/d buyer's works.

LEAD, WHITE.—SCOTLAND: £39 per ton, carriage paid. LONDON: £37 10s.

LITHOPONE.—30%, £17 10s. to £18 per ton.

MAGNESITE.—SCOTLAND: Ground calcined, £9 per ton, ex store.

METHYLATED SPIRIT.—61 O.P. Industrial, 1s. 6d. to 2s. 1d. per gal. Pyridinised industrial, 1s. 8d. to 2s. 3d. Mineralised, 2s. 7d. to 3s. 1d. 64 O.P. 1d. extra in all cases. Prices according to quantities. SCOTLAND: Industrial 64 O.P., 1s. 9d. to 2s. 4d.

NICKEL AMMONIUM SULPHATE.—£49 per ton d/d.

NICKEL SULPHATE.—£49 per ton d/d.
PHENOL.—8½d. to 9d. per lb. without engagement.
POTASH, CAUSTIC.—LONDON: £42. MANCHESTER: £36 10s.
POTASSIUM BICHROMATE.—Crystals and Granular, 5d. per lb. net d/d U.K. Discount according to quantity. Ground 5½d. LONDON: 5d. per lb. with usual discounts for contracts. SCOTLAND: 5d. d/d U.K. or c.i.f. Irish Ports. MANCHESTER: 5d.
POTASSIUM CHLORATE.—LONDON: £37 to £40 per ton. SCOTLAND: 99½/100%, powder, £37. MANCHESTER: £37 to £38.
POTASSIUM CHROMATE.—6½d. per lb. d/d U.K.
POTASSIUM NITRATE.—SCOTLAND: Refined granulated, £29 per ton c.i.f. U.K. ports. Spot, £30 per ton ex store.
POTASSIUM PERMANGANATE.—LONDON: 9½d. per lb. SCOTLAND: B.P. crystals, 9d. MANCHESTER: Commercial, 8½d.; B.P., 9½d. to 9½d.
POTASSIUM PRUSSIAN.—LONDON: 8½d. to 8½d. per lb. SCOTLAND: Yellow spot material, 8½d. ex store. MANCHESTER: Yellow, 8½d.
RUPRON (MINERAL RUBBER).—£16 10s. per ton.
SALAMMONIAC.—First lump spot, £41 17s. 6d. per ton d/d in barrels.
SODA ASH.—58% spot, £5 15s. per ton f.o.r. in bags.
SODA, CAUSTIC.—Solid 76/77° spot, £13 17s. 6d. per ton d/d station. SCOTLAND: Powdered 98/99%, £17 10s. in drums, £18 5s. in casks, Solid 76/77°, £14 10s. in drums; 70/73%, £14 12s. 6d., carriage paid buyer's station, minimum 4-ton lots; contracts 10s. per ton less. MANCHESTER: £13 5s. to £14 contracts.
SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.
SODIUM ACETATE.—£22 per ton. LONDON: £23.
SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags. SCOTLAND: Refined recrystallised £10 15s. ex quay or station. MANCHESTER: £10 10s.
SODIUM BICHROMATE.—Crystals cake and powder 4d. per lb. net d/d U.K. discount according to quantity. Anhydrous, 5d. per lb. LONDON: 4d. per lb. net for spot lots and 4d. per lb. with discounts for contract quantities. SCOTLAND: 4d. delivered buyer's premises with concession for contracts.
SODIUM BISULPHITE POWDER.—60/62%, £16 10s. per ton d/d 1-cwt. iron drums for home trade.
SODIUM CARBONATE (SODA CRYSTALS).—SCOTLAND: £5 to £5 5s. per ton ex quay or station. Powdered or pea quality 7s. 6d. per ton extra. Light Soda Ash £7 ex quay, min. 4-ton lots with reductions for contracts.
SODIUM CHLORATE.—£32 per ton.
SODIUM CHROMATE.—4d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—SCOTLAND: Large crystals English manufacture, £9 5s. per ton ex stations, min. 4-ton lots. Pea crystals, £15 ex station, 4-ton lots. MANCHESTER: Commercial, £9 5s.; photographic, £15.
SODIUM META SILICATE.—£16 per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—LONDON: Spot, £18 to £20 per ton d/d station in drums.
SODIUM PERBORATE.—LONDON: 10d. per lb.
SODIUM PHOSPHATE.—£12 10s. per ton.
SODIUM PRUSSIAN.—LONDON: 5d. to 5½d. per lb. SCOTLAND: 5d. to 5½d. ex store. MANCHESTER: 4½d. to 5½d.
SODIUM SILICATE.—140° Tw. Spot £8 per ton d/d station, returnable drums.
SODIUM SULPHATE (GLAUBER SALTS).—£4 2s. 6d. per ton d/d. SCOTLAND: English material £3 15s.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 15s. per ton d/d station in bulk. SCOTLAND: Ground quality, £3 5s. per ton d/d. MANCHESTER: £3 5s.
SODIUM SULPHIDE.—Solid 60/62% Spot, £10 15s. per ton d/d in drums; crystals 30/32%, £8 per ton d/d in casks. SCOTLAND: For home consumption, Solid 60/62%, £10 5s.; broken 60/62%, £11 5s.; crystals, 30/32%, £8 2s. 6d. d/d buyer's works on contract, min. 4-ton lots. Spot solid 5s. per ton extra. Crystals, 2s. 6d. per ton extra. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8.
SODIUM SULPHITE.—Pea crystals spot, £13 10s. per ton d/d station in kegs. Commercial spot, £9 10s. d/d station in bags.
SULPHATE OF COPPER.—MANCHESTER: £14 7s. 6d. per ton f.o.b.
SULPHUR.—£10 15s. per ton. SCOTLAND: Flowers, £11; roll, £10 10s.; rock, £9; ground American, £10 ex store.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quality.

Coal Tar Products

ACID, CARBOLIC.—Crystals, 8½d. to 8½d. per lb.; crude, 60's, 2s. 11d. to 2s. 2½d. per gal. MANCHESTER: Crystals, 7½d. to 8d. per lb.; crude, 2s. 1d. per gal. SCOTLAND: 60's, 2s. 6d. to 2s. 7d.
ACID, CRESYLIC.—90/100%, 1s. 8d. to 2s. 3d. per gal.; pale, 98%, 1s. 6d. to 1s. 7d.; according to specification. LONDON: 98/100%, 1s. 3d.; dark, 95/97%, 11d. SCOTLAND: Pale, 99/100%, 1s. 3d. to 1s. 4d.; dark, 97/99%, 1s. to 1s. 1d.; high boiling acid, 2s. 6d. to 3s.
ANTHRACENE OIL.—Strained, 4½d. per gal.
BENZOL.—At works, crude, 9d. to 9½d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4d. to 1s. 4½d.; pure, 1s. 7½d. to 1s. 8d. LONDON: Motor, 1s. 6½d. SCOTLAND: Motor, 1s. 6½d.

CREOSOTE.—B.S.I. Specification standard, 3½d. to 4d. per gal. f.o.r. Home, 3½d. d/d. LONDON: 3d. f.o.r. North; 4d. London. MANCHESTER: 3½d. to 4½d. SCOTLAND: Specification oils, 4d.; washed oil, 4½d. to 4½d.; light, 4½d.; heavy, 4½d. to 4½d.
NAPHTHA.—Solvent, 90/160%, 1s. 6d. to 1s. 7d. per gal.; 95/160%, 1s. 7d. to 1s. 8d.; 99%, 11d. to 1s. 1d. LONDON: Solvent, 1s. 3½d. to 1s. 4d.; heavy, 11d. to 1s. 0½d. f.o.r. SCOTLAND: 90/160%, 1s. 3d. to 1s. 3½d.; 90/190%, 11d. to 1s. 2d.
NAPHTHALENE.—Purified crystals, £9 15s. per ton in bags. LONDON: Fire lighter quality, £3 to £3 10s.; 74/76 quality, £4 to £4 10s.; 76/78 quality, £5 10s. to £6. SCOTLAND: 40s. to 50s.; whizzed, 70s. to 75s.
PITCH.—LONDON: £2 19s. to £3 1s. per ton f.o.b. East Coast port for next season's delivery.
PYRIDINE.—90/140, 6s. 6d. to 8s. per gal.
TOLUOL.—90%, 2s. 2d. per gal.; pure, 2s. 5d.
XYLOL.—Commercial, 2s. 2d. per gal.; pure, 2s. 4d.

Intermediates and Dyes

ACID, BENZOIC, 1914 B.P. (ex Toluol).—1s. 9½d. per lb.
ACID, GAMMA.—Spot, 4s. per lb. 100% d/d buyer's works.
ACID, H.—Spot, 2s. 4½d. per lb. 100% d/d buyer's works.
ACID NAPHTHIONIC.—1s. 8d. per lb.
ACID, NEVILLE AND WINTHER.—Spot, 3s. per lb. 100% d/d buyer's works.
ACID, SULPHANILIC.—Spot, 8d. per lb. 100% d/d buyer's works.
ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—Spot, 1s. 8d. per lb., packages extra.
BENZIDINE BASE.—Spot, 2s. 5d. per lb. 100% d/d buyer's works.
BENZIDINE, HCL.—2s. 5d. per lb.
p-CRESOL 34-5° C.—2s. per lb. in ton lots.
m-CRESOL 98/100%.—2s. 3d. per lb. in ton lots.
DICHLORANILINE.—1s. 11½d. to 2s. 3d. per lb.
DIMETHYLANILINE.—Spot, 1s. 6d. per lb., package extra.
DINITROBENZENE.—8d. per lb.
DINITROCHLOROBENZENE, SOLID.—£72 per ton.
DINITROTOLUENE.—48/50° C., 9d. per lb.; 66/68° C., 10½d.
DIPHENYLAMINE.—Spot, 2s. per lb., d/d buyer's works.
α-NAPHTHOL.—Spot, 2s. 4d. per lb., d/d buyer's works.
β-NAPHTHOL.—Spot, £78 15s. per ton in paper bags; £79 5s. in casks, in 1-ton lots.
α-NAPHTHYLAMINE.—Spot, 11½d. per lb., d/d buyer's works.
β-NAPHTHYLAMINE.—Spot, 2s. 9d. per lb. d/d buyer's works.
o-NITRANILINE.—3s. 11d. per lb.
m-NITRANILINE.—Spot, 2s. 7d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 8d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. per lb.; 5-cwt. lots, drums extra.
NITRONAPHTHALENE P.G.—1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 9d. per lb.
o-TOLUIDINE.—9½d. per lb.
p-TOLUIDINE.—1s. 11d. per lb.

Nitrogen Fertilisers

SULPHATE OF AMMONIA.—Home: £7 5s. per ton delivered in 6-ton lots to farmer's nearest station. Export: Nominal £5 17s. 6d. per ton f.o.b. U.K. ports in single bags.
CYANAMIDE.—£7 5s. per ton carriage paid to any railway station in Great Britain in lots of 4 tons and over.
NITRATE OF SODA.—£7 18s. 6d. per ton delivered in 6-ton lots to farmer's nearest station.
NITRO-CHALK.—£7 5s. per ton delivered in 6-ton lots to farmer's nearest station.
CONCENTRATED COMPLETE FERTILISERS.—£10 15s. to £11 6s. per ton according to percentage of constituents.
NITROGEN PHOSPHATE FERTILISERS.—£10 5s. to £13 15s. per ton according to percentage of constituents.

Latest Oil Prices

LONDON, June 20.—LINSEED OIL was easier. Spot, £23 15s. (small quantities 30s. extra); July, £22 7s. 6d.; July-Aug., £22 10s.; Sept.-Dec., £22 15s.; Jan.-April, £22 12s. 6d., naked. SOYA BEAN OIL was quiet. Oriental (bulk), June-July shipment, £12 15s. per ton. RAPE OIL was inactive. Crude, extracted, £28; technical, refined, £29 10s., naked, ex wharf. COTTON OIL was steady. Egyptian crude, £13; refined common edible, £16 10s.; and deodorised, £18, naked, ex mill (small lots 30s. extra). TURPENTINE was lower. American, spot, 43s. 6d. per cwt.
HULL.—LINSEED OIL, spot, quoted £23 2s. 6d. per ton; June, £22 10s.; July-Aug., £22 15s.; Sept.-Dec. and Jan.-April, £23, naked. COTTON OIL.—Egyptian, crude, spot, £13 10s. edible, refined, spot, £15 10s.; technical, spot, £15 10s.; deodorised, £17 10s., naked. PALM KERNEL OIL, crude, f.m.q., spot, £13 10s., naked. GROUNDNUT OIL, extracted, spot, £19; deodorised, £23, per ton. RAPE OIL, extracted, spot, £27; refined, £28 10s. SOYA OIL, extracted, spot, £15 10s.; deodorised, £18 10s. per ton. COD OIL, 25s. per cwt. CASTOR OIL, pharmaceutical, 35s. 6d.; first, 30s. 6d.; second, 27s. 6d. per cwt. TURPENTINE.—American, spot, 45s. 6d. per cwt.

Inventions in the Chemical Industry

Patent Specifications and Applications

THE following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Specifications Accepted with Dates of Application

PRODUCTION of compositions of matter by the esterification of cellulosic material.—Cellulose Acetate Silk Co., Ltd., and V. E. Yarsley. Nov. 3, 1932. 411,501.

DEGREASING by means of volatile solvents, process and apparatus.—W. E. Booth, J. Savage, and Imperial Chemical Industries, Ltd. Nov. 7, 1932. 411,468.

LIQUID CHLOROTHYMOLOIDS AND CHLOROCARVACROLOIDS, production.—E. Momm. Nov. 28, 1932. 411,430.

SULPHUR DYE STUFFS, manufacture.—A. Carpmæl (I. G. Farbenindustrie). Nov. 29, 1932. 411,431.

PREVENTION of discoloration in liquid aromatic amines.—Imperial Chemical Industries, Ltd. E. I. du Pont de Nemours and Co.). Dec. 1, 1932. 411,433.

LIQUID HYDROCARBONS of low boiling point by the thermal treatment of tars, mineral oils, and the like, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Dec. 2, 1932. 411,477.

ORGANIC MERCURY COMPOUNDS, process for manufacture.—A. Carpmæl (I. G. Farbenindustrie). Dec. 2, 1932. 411,507.

SHEET MATERIALS containing cellulose esters or ethers, production.—British Celanese, Ltd. Dec. 3, 1931. 411,471.

THIAZOLE COMPOUNDS and azo dyestuffs derived therefrom, manufacture.—A. Carpmæl (I. G. Farbenindustrie). Dec. 5, 1932. 411,479.

OIL-SOLUBLE RESINS and the production thereof.—W. J. Tennant (Bakelite Corporation). Dec. 5, 1932. 411,442.

ALDOL CONDENSATION PRODUCTS, production.—Distillers Co., Ltd., J. V. Eyre and H. Langwell. Dec. 6, 1932. 411,483.

SULPHONIC ACIDS of the benzene series, manufacture.—A. Carpmæl (I. G. Farbenindustrie). Dec. 6, 1932. 411,458.

DIHYDROXY-FLUORANTHENE and the dialkyl ethers thereof, manufacture.—I. G. Farbenindustrie. Dec. 11, 1931. 411,530.

MIXED FERTILISERS, manufacture and production.—J. Y. Johnson (I. G. Farbenindustrie). Jan. 13, 1933. 411,575.

SEPARATION of mixtures of alkali metal nitrates with ammonium chloride.—J. Y. Johnson (I. G. Farbenindustrie). Jan. 28, 1933. 411,587.

PROCESS for obtaining growth-exciting substances from thymus glands.—Soc. of Chemical Industry in Basle. July 1, 1932. 411,690.

PRODUCTION of sulphuric acid by the contact process from small quantities of sulphur dioxide.—Metallges A.-G., and H. Klencke. Jan. 12, 1934. 411,779.

Applications for Patents

CADMIUM PIGMENTS, production.—G. Siegle and Co. May 17. (Germany, May 17, '33.) 14960.

SULPHURISED DYE STUFFS, manufacture.—Soc. of Chemical Industry in Basle. May 17. (Switzerland, May 17, '33.) 14918.

ALKALI NITRATES from alkali chlorides, preparation.—A. Bieler, and A. Guyer. May 26. (Switzerland, June 12, '33.) 15734.

PROCESSES FOR CONVERSION of pinene to camphene.—British Xylonite Co., Ltd., and R. S. Colborne. May 30. 16139.

EMULSIONS of latex-like character, manufacture.—A. Carpmæl (I. G. Farbenindustrie). May 24. 15544.

CONDENSATION PRODUCTS, manufacture.—A. Carpmæl (I. G. Farbenindustrie). May 24. 15545, 15546.

VAT DYE STUFFS, manufacture.—A. Carpmæl (I. G. Farbenindustrie). May 28. 15883.

CELLULOSE ACETATES, manufacture.—Cellulose Acetate Silk Co., Ltd., D. Hayes, F. Taylor and H. Wood. May 30. 16156.

SUBSTITUTED BARBITURIC ACIDS, manufacture.—Chemische Fabrik Von Heyden, A.-G. May 29. (Germany, June 3, '33.) 16009.

VAT DYE STUFFS, preparation.—E. I. du Pont de Nemours and Co. May 24. (United States, May 24, '33.) 15570.

HIGHER ALKYL ESTERS of carboxylic series, preparation.—E. I. du Pont de Nemours and Co. May 25. (United States, May 25, '33.) 15658.

ORGANIC COMPOUNDS, production.—E. I. du Pont de Nemours and Co. May 28. (United States, May 26, '33.) 15915.

ORGANIC CYANOGEN COMPOUNDS, manufacture.—E. I. du Pont de Nemours and Co. May 28. (United States, May 26, '33.) 15916.

AMINES, manufacture.—E. I. du Pont de Nemours and Co. May 28. (United States, May 26, '33.) 15917.

CHEMICAL PROCESS.—E. I. du Pont de Nemours and Co. May 28. (United States, May 26, '33.) 15918.

SULPHONIC ACIDS, production.—Farb-und Gerbstoff-Werke C. Fleisch Jr. May 29. (Germany, May 29, '33.) 15971.

DRUM FILTERS.—Fraser and Chalmers (S.A.), Ltd. May 28. (Union of South Africa, July 25, '33.) 15909.

SUBSTITUTED ACID AMIDES, manufacture.—I. G. Farbenindustrie. May 28. (Germany, June 13, '33.) 15828.

RIPENING ALKALI CELLULOSE, process.—I. G. Farbenindustrie. (Germany, June 27, '33.) 15829.

HYDROCYANIC ACID, production.—Imperial Chemical Industries, Ltd., and R. M. Winter. May 24. 15559.

POTASSIUM SULPHATE, production.—Imperial Chemical Industries, Ltd., A. E. Cashmore and I. L. Clifford. May 24. 15560.

PURIFICATION OF CELLULOSE ALKYL ETHERS.—Imperial Chemical Industries, Ltd. May 28. 15822.

CONCENTRATION of heavy water in water.—Imperial Chemical Industries, Ltd., and D. Tyrer. May 29. 16027.

CONCENTRATION of diplogen.—Imperial Chemical Industries, Ltd., and D. Tyrer. May 29. 16028.

PREPARATION OF BLOOD, etc., for diagnostic purposes.—J. Y. Johnson (I. G. Farbenindustrie). May 24. 15505.

STABLE SUSPENSIONS of animal tissue cells, preparation.—J. Y. Johnson (I. G. Farbenindustrie). May 24. 15506.

WETTING, ETC., AGENTS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). May 28. (Nov. 5, '32.) 15849.

RECOVERY of valuable products from hydrocarbons.—J. Y. Johnson (I. G. Farbenindustrie). May 30. 16133.

SYNTHETIC RESINS, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). May 30. 16134.

HYDROGENATED ORGANIC COMPOUNDS, production.—J. Y. Johnson (I. G. Farbenindustrie). May 30. 16136.

REMOVAL OF IMPURITIES from water, etc., in steam generators, etc.—Liverpool Borax Co., Ltd., H. W. Bannister, G. S. Irving, and T. Millican. May 25. 15573.

PHENOLS from lignite tar, etc., production.—J. Meyer. May 30. 16094.

VAT DYE COMPOSITIONS.—National Aniline and Chemical Co., Inc. May 25. (United States, May 26, '33.) 15649.

VAT DYE COMPOSITIONS.—National Aniline and Chemical Co., Inc. May 25. (United States, May 26, '33.) 15650.

AMMONIUM SALTS, ETC., production.—P. Parrish. May 30. 16091.

SHATTERPROOF GLASS, manufacture.—H. E. Potts (Shawinigan Chemicals, Ltd.). May 30. 16077.

LIQUID MONOMERIC FORMALDEHYDE, production.—R. Spence and W. Wild. May 24. 15470.

HIGHER-ALIPHATIC, ETC., SULPHONIC ACIDS, manufacture.—W. J. Tennant (Henkel et Cie, Ges.). May 28. 15871.

ALKALI REACTING CLEANSING AGENTS.—W. J. Tennant (Henkel et Cie, Ges.). May 28. 15872.

ALCOHOL FROM SUGAR BEETS, etc., production.—Aktiebolaget Separator and N. E. Svensjo. June 6. 16823.

AQUEOUS DISPERSIONS of bituminous materials, manufacture.—J. F. T. Blott, Colas Products, Ltd., and L. G. Gabriel. June 2. 16450.

ALKALINE EARTH METALS by electrolysis, obtaining.—Calloy, Ltd. June 2. 16494.

MAGNESIUM FROM MAGNESITE, etc., obtaining.—Calloy, Ltd. June 5. 16704.

VAT DYE STUFFS, manufacture.—A. Carpmæl and I. G. Farbenindustrie. June 1. 16423.

DERIVATIVES OF CARBOHYDRATES, manufacture.—A. Carpmæl and I. G. Farbenindustrie. June 1. 16424.

DYEINGS ON CELLULOSE MATERIALS, treatment.—A. Carpmæl and I. G. Farbenindustrie. June 1. 16425.

HETEROCYCLIC COMPOUNDS, manufacture.—A. Carpmæl and I. G. Farbenindustrie. June 1. 16426.

CHEMICAL PRODUCTS.—E. I. du Pont de Nemours and Co. June 1. 16377.

DYE STUFFS, manufacture.—E. I. du Pont de Nemours and Co. June 4. (United States, June 3, '33.) 16609.

AMINES, manufacture.—E. I. du Pont de Nemours and Co. June 4. (United States, June 2, '33.) 16610.

BASIC COPPER CHLORIDES, manufacture.—I. G. Farbenindustrie. May 31. (Germany, May 31, '33.) 16267.

SUBSTITUTED ALDOLS, manufacture.—I. G. Farbenindustrie. June 1. (Germany, June 2, '33.) 16383.

DYE STUFFS, manufacture.—I. G. Farbenindustrie. June 1. (Germany, June 3, '33.) 16427.

DYE STUFFS, manufacture.—I. G. Farbenindustrie. June 4. (Germany, June 3, '33.) 16592. (Germany, May 26.) 16593.

SUBSTITUTED AROMATIC AMINO-COMPOUNDS, manufacture.—I. G. Farbenindustrie. June 4. (Germany, June 3, '33.) 16596.
 POLYMETHINE DYESTUFFS, manufacture.—I. G. Farbenindustrie. June 5. (Germany, June 10, '33.) 16720.
 VAT DYESTUFF, manufacture.—Imperial Chemical Industries, Ltd., and R. J. Loveluck. May 31. 16318.
 RECOVERY OF MINERALS by froth flotation.—Imperial Chemical Industries, Ltd. June 1. 16434.
 CONCENTRATION OF HEAVY WATER IN WATER.—Imperial Chemical Industries, Ltd., and D. Tyrer. June 1. 16435.
 PHOSPHATIC MATERIALS, manufacture.—Imperial Chemical Industries, Ltd. June 6. 16862.
 LIQUID HYDROCARBONS, production.—International Hydrogenation Patents Co., Ltd. June 2. (Germany, July 14, '33.) 16471.
 SEPARATION OF liquid hydrocarbon mixtures, etc.—J. Y. Johnson and I. G. Farbenindustrie. June 1. 16378.
 AZO DYESTUFFS, production.—J. Y. Johnson and I. G. Farbenindustrie. June 2. 16480.
 HYDROCARBONS, purification.—J. Y. Johnson and I. G. Farbenindustrie. June 2. 16481.
 AROMATIC HYDROXY COMPOUNDS, production.—J. Y. Johnson and I. G. Farbenindustrie. June 2. 16482.
 TIN OXIDE, manufacture.—M. Leroy. June 4. (France, June 6, '33.) 16562.
 DIBENZOTHIADISULPHIDE, preparation.—Silesia Verein Chemischer Fabriken. June 1. (Germany, July 18, '33.) 16431.
 SUBSTITUTED ALKALI METAL AMIDES.—K. Ziegler. June 6. (Germany, June 7, '33.) 16846.
 SYNTHESIS OF AMMONIA.—J. Basset, Compagnie de Produits Chimiques et Electro-metallurgiques Alais, Froges, et Camargue. June 11. (France, June 27, '33.) 17233.
 CARBIDE Cakes, production.—Carbic, Ltd. June 8. (Germany, Dec. 3, '33.) 17095.
 CONDENSATION PRODUCTS, manufacture.—A. Carpmal (I. G. Farbenindustrie). June 12. 17416.
 POLYMERISATION PRODUCTS, manufacture.—A. Carpmal (I. G. Farbenindustrie). June 13. 17503.
 QUATERNARY AMMONIUM COMPOUNDS, etc., manufacture.—A. Carpmal (I. G. Farbenindustrie). June 13. 17504.
 MANUFACTURE OF shaped articles from polyvinyl alcohols.—Consortium für Elektrochemische Industrie Ges. June 8. (Oct. 10, '33.) (Germany, Oct. 17, '32.) 17056.
 AMINES, manufacture.—E. I. du Pont de Nemours and Co. June 8. (United States, June 9, '33.) 17101.
 DYE, ETC., VATS.—E. Farrell. June 8. 16980.
 URIC-ACID-DISSOLVING REMEDIES.—J. Gaathaug. June 12. (Norway, June 29, '33.) 17406.
 LEATHER, production.—J. R. Geigy. June 13. (Germany, June 14, '33.) 17496.

SHEETS FROM POLYMERISATION PRODUCTS, manufacture.—W. W. Groves (Deutsche Celluloid Fabrik). June 7. 16921.
 WELDING.—W. W. Groves (I. G. Farbenindustrie). June 12. 17381.
 DEVELOPMENT OF silver-halide emulsions.—W. W. Groves (I. G. Farbenindustrie). June 13. 17494.
 DIPHENYLMETHANE DERIVATIVES, manufacture.—I. G. Farbenindustrie. June 8. (Germany, June 9, '33.) 17065.
 MANUFACTURE OF 1,4-dihalogen-anthraquinone-2-carboxylic acids. I. G. Farbenindustrie. June 8. (Germany, June 9, '33.) 17066.
 INDIGOID VAT DYESTUFFS, manufacture.—I. G. Farbenindustrie. June 8. (Germany, June 8, '33.) 17067.
 SUBSTITUTED ACID AMIDES, manufacture.—I. G. Farbenindustrie. June 12. (Germany, June 13, '33.) 17382.
 SUBSTITUTED ACID AMIDES, manufacture.—I. G. Farbenindustrie. June 12. (Germany, Nov. 18, '33.) 17383.
 COLOURING MATTERS.—Imperial Chemical Industries, Ltd., C. Childs and H. A. Thomas. June 8. 17100.
 COLOURING MATTERS, manufacture.—Imperial Chemical Industries, Ltd., C. E. Dent and R. P. Linstead. June 11. 17276.
 TEXTILE ASSISTANTS.—Imperial Chemical Industries, Ltd. June 12. 17432.
 RUBBER MANUFACTURE.—Imperial Chemical Industries, Ltd. April 6. 17433.
 IMPROVING NATURAL RESINS, etc.—Imperial Chemical Industries, Ltd. June 13. 17535.
 DYESTUFFS OF the anthraquinone series, manufacture.—J. Y. Johnson (I. G. Farbenindustrie). June 8. 17060.
 PROCESS for improving lubricating oils.—J. Y. Johnson (I. G. Farbenindustrie). June 8. 17061.
 SEPARATING SOLIDS FROM LIQUIDS.—T. D. Kelly. June 13. 17477.
 HYDROCARBON OILS, treatment.—A. L. Mond (Universal Oil Products Co.). June 8. 17105.
 AMMONIUM SULPHATE, manufacture.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. June 11. (United States, June 24, '33.) 17279.
 REMOVING ACIDIC COMPONENTS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. June 13. (United States, June 28, '33.) 17537.
 PECTIN, manufacture.—Sardik, Inc. June 8. (United States, July 11, '33.) 17005.
 OESTROGENOUS PRODUCTS, manufacture.—Schering-Kahlbaum. June 12. (Germany, June 13, '33.) 17415.
 DERIVATIVES OF cyclic β -ketocarboxylic acids.—Schering-Kahlbaum. June 13. (Germany, June 13, '33.) 17505.
 COMPOUND CALCIUM MAGNESIUM PHOSPHATES, manufacture.—T. Schmidt. June 11. 17247.

Company News

Phoenix Oil and Transport Co.—A dividend of $2\frac{1}{2}$ per cent. is announced, less tax, in respect of the year 1933. For 1932 the rates were the same.

United Indigo and Chemical Co.—The payment of a dividend on the 5 per cent. preference shares is announced for the six months ending June 30, 1934.

Tarmac.—The payment will be made on July 2 of the half-yearly dividend on the $5\frac{1}{2}$ per cent. (free of tax) cumulative preference shares.

Esperanza Copper and Sulphur Co.—The report for the year 1933 states that the profit was £641 against £4,860 in 1932. The balance brought forward was £28,059, making a total of £28,700 to be carried forward.

Aberthaw and Bristol Channel Portland Cement.—For the year ended March 31, the trading profit was £44,615. The sum of £30,000 is provided for depreciation, and after the year's dividend on the preference shares, there remains to be carried forward £44,268. No dividend is to be paid on the ordinary shares.

Sangers, Ltd.—A final dividend is recommended on the old ordinary 5s. shares of $11\frac{1}{2}$ per cent., making 20 per cent. for the year to March 31 last, compared with $17\frac{1}{2}$ per cent. for the previous year. The new ordinary 5s. shares will receive half the year's dividend, 10 per cent.

Ilford, Ltd.—The directors have decided to defer the consideration of a dividend on the ordinary shares until the accounts for the financial year ending October 31, 1934, have been completed. No interim ordinary payment was made for the previous year, but a final payment of 6 per cent. was made.

"Pechiney" (Cie. de Produits Chimiques et Electro-Metallurgiques Alais, Froges et Camargue S.A. in Lyon).—The accounts of this company, which controls a considerable proportion of French aluminium output, shows an increase in trading profit from 17,800,000f. to 47,700,000f. After deducting all charges, including depreciation, the net profit was 16,800,000f. The directors recommend a dividend on the ordinary shares of 6 per cent., and on the shares conferring additional voting rights of $5\frac{1}{2}$ per cent.

British Bemberg Co.—The company reports a manufacturing profit for 1933 of £74,285, compared with £8,918 in the previous year. After allowing for debenture interest, depreciation, etc., there is a net loss of £24,162, against £88,003, making, with the debit brought in of £220,788, a total debit to be carried forward of £244,951.

Bleachers' Association, Ltd.—The directors report a net profit of £2,425 for the year ended March 31; this compares with £107,173 for 1932-33, £112,634 for 1931-32, £4,576 for 1930-31, and £466,391 for 1929-30. The preference dividend will remain in arrear as from June 30, 1933. No ordinary dividend has been paid since that of $6\frac{1}{2}$ per cent. for 1929-30.

New Companies Registered

Colma Products, Ltd., 116 Victoria Street, S.W.1.—Registered June 18. Nominal capital £100. Purchasers, manufacturers, and marketers of chemicals and chemical products of all kinds, etc. Director: Wilfred E. Billingham.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

France.—An agent established at Paris wishes to obtain the representation, on a commission or a purchase basis, of United Kingdom exporters of Chinese wood oils. (Ref. No. 633.)

Latvia.—A commission agent in Riga desires to obtain the representation of United Kingdom producers of industrial chemicals. (Ref. No. 637.)

China (Shanghai).—An established firm of British importers invites correspondence from manufacturers and suppliers of industrial and pharmaceutical chemicals, etc. (Ref. No. 640.)

From Week to Week

THOMAS FIRTH AND JOHN BROWN, LTD., announce that Mr. J. Wortley Fawcett, Dr. W. H. Hatfield and Mr. Arthur Matthews have joined the board.

THE DEATH OCCURRED at Bracken Hill, Denholm, on June 18, of Mr. John Denton, A.I.C., F.C.S., dyer and bleacher, late of Great Horton and Long Preston. The funeral service was at Great Horton Church, Bradford, on June 21.

WHILE SUPERINTENDING EXTENSIONS to the factory of the Central Sugar Beet Co., at Peterborough, on June 14, Alfred Wyldbore, 30, a foreman in the company's employ, fell 70 ft. from the top of the building. He died a few hours later in Peterborough Hospital.

THE NOMINAL CAPITAL of the Murphy Chemical Co., Ltd., High Street, Wheathampstead, Herts., has been increased by the addition of £20,000 beyond the registered capital of £33,000. The additional capital is divided into 10,000 "B" preference and 10,000 "C" preference shares of £1 each.

MR. EDWARD L. PEASE, of Hurworth Moor, Darlington, chairman of Ashmore, Benson, Pease and Co. (gasworks and boiler engineers, Stockton), the Power Gas Corporation, Waste Heat and Gas Electrical Generating Stations, Newcastle, and Power Spirits, Stockton, and a director of several other iron, steel, and coal companies, late a director of Pease and Partners, Ltd., Darlington, who died on March 15 last, left £23,944 gross, with net personalty £2,204.

THE NATIONAL FEDERATION of Associated Paint, Colour and Varnish Manufacturers of the United Kingdom has held its annual conference this week, from Monday to Friday, at Turnberry, Scotland. The president, Mr. S. R. Hadfield, took the chair, and on Tuesday he held an after-dinner reception at the Turnberry Hotel. Among the subjects discussed at the conference have been ships' paint, white lead, oil varnish, water paints, packed goods and transport.

THE INSTITUTE OF CHEMISTRY has published in booklet form the two lecture-demonstrations on "Micro-Chemical Methods Suitable for General Analytical Practice," which Professor H. V. A. Briscoe and Dr. Janet W. Matthews delivered before the Institute on March 14 and 26. Professor Briscoe delivered the first lecture, while Mrs. Matthews, with the aid of a lantern, exhibited the apparatus, and Mrs. Matthews delivered the second lecture, while Professor Briscoe showed reactions, spot tests, etc. with the aid of an epidiascope.

AS A RESULT OF THE RECENT International Industrial Property Conference in London extensive amendments were made to the convention which to a large extent governs the patent and trade mark laws of all the more important countries in the world, and a new convention incorporating these amendments was signed. The changes made were explained in an authoritative article in the "Times" Trade and Engineering Supplement on June 16, the writer states that they will undoubtedly assist in removing many difficulties which have in the past confronted British business men in their international trade.

SIGNIFICANT QUESTIONS WERE ASKED at Glasgow Town Council last week regarding a proposal by the Corporation to install plant at Provan Chemical Works for the manufacture of sulphuric acid. The convener of the gas committee was asked if he would state the reasons for putting down the plant, what was the estimated cost of the plant, and whether the sulphuric acid required by the chemical works department was already manufactured within the city. The convener was also asked if he were aware that the establishment of sulphuric acid plant at Provan Works by the Corporation was likely to displace Glasgow workpeople at present employed in its manufacture within the city, and whether he would take the matter back for consideration.

PROFESSOR A. C. SEWARD, professor of botany in the University of Cambridge, has been elected a foreign member of the Botany Class of the Royal Swedish Academy of Sciences.

NOTICE WAS GIVEN in the "London Gazette" of June 19 of the voluntary winding-up of Langdale's Chemical Manure Co., Ltd., and the appointment of Mr. J. M. S. Coates, of 31 Mosley Street, Newcastle-upon-Tyne, as liquidator.

THE DEATH OCCURRED at HORNSEA on June 12 of Mr. M. H. Hargreaves, founder of the firm of Hargreaves Brothers and Co., black lead manufacturers, from which he retired in 1912. The funeral service was at Trinity Methodist Church, Hornsea, on June 15, followed by cremation at Hull.

THE SPIRIT OF ECONOMIC NATIONALISM must be subordinated before economic prosperity can be achieved, declared Mr. L. H. Swinbank, of Imperial Chemical Industries, Ltd., speaking at a Purchasing Agents' Conference at Cleveland, Ohio, on Monday. "In England we hear the advice, 'Buy British,' which is only half true," said Mr. Swinbank. "We must also sell British, and our foreign customers must sell to us in order to buy from us."

A GENERAL MEETING of the North of England Institute of Mining and Mechanical Engineers will be held in the Lecture Theatre of the Institute, Newcastle-upon-Tyne, to-day (Saturday), at 2.30. Papers on "Unusual Boring Problems," by Mr. E. Chicken, and "Aerial Ropeways and their Application to Colliery Purposes," by Mr. H. F. H. Shields will be open for further discussion, and a paper on "Winding Accidents—Their Cause and Prevention," will be read by Mr. E. H. Oliver.

THE WORKS OF HENRY MATTHEWS, Bristol, oil and paint manufacturers, were severely damaged by fire on June 14, three floors being involved before the flames were under control. Within a few moments of the outbreak being discovered the roof was a mass of flames. As soon as the fire brigade returned to headquarters a call was received from Portishead, which was enveloped in smoke from the works of W. H. Keys, bitumen refiners. Thousands of gallons of crude oil were involved. Two large tanks within a few hundred yards of the fire were in danger. The firemen were impeded in their work by hot oil and tar, which ran ankle deep near the burning premises. Portishead and Bristol brigades worked for an hour to subdue the flames.

THE NATIONAL COUNCIL of the Commercial Motor Users' Association, of which Mr. J. France is president, and the National Council of the Road Haulage Association, of which Mr. R. W. Sewill is chairman, held meetings in London last week to discuss steps to secure a closer measure of co-ordination within the commercial motor transport industry, and it was resolved by both organisations to negotiate with a view to an amalgamation of the two bodies into one large organisation. The result of such an amalgamation would mean not only that the road motor transport industry would be in a position to speak with a more united voice, but it should be the forerunner of further amalgamations with other organisations in the industry.

RECENT WILLS include: Mr. Charles C. Bryce, of Great Tower Street, London, E.C., and of Kensington, S.W., managing director of Bryce, Roberts and Co., chemical manufacturers, £51,292 (net personalty £44,304); Dame Muriel Marie Vaughan-Morgan, of Chesham House, Chesham Place, London, S.W., widow of Sir Kenyon Pascoe Vaughan-Morgan, £60,105 (net personalty £46,851); Mr. John M. Tallantyre, of Pelham Grove, Sefton Park, Liverpool, late director of Evans, Sons, Lescher, and Webb, Ltd., manufacturing chemists, £2,323 (net personalty £2,236); Mrs. Isabel Mary Martindale, of 22 Chatsworth Road, Brondesbury, N.W., widow of W. Harrison Martindale, Ph.D., Ph.C., F.C.S., late of 12 New Cavendish Street, W., £27,542 (net personalty, £20,427).

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